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EDITORIAL NOTES.

Labour Troubles in the Coalfields.

EXCURSIONS and alarums continue to be the order of the day in the coalfields of Great Britain, and those reported in the newspapers last week are by no means such as can be ignored by anyone whose duty it is to keep himself well informed upon all points affecting the present or future condition of the coal market. The event that calls for most serious attention is the giving of six months' notice to terminate the sliding-scale agreement at present in force in the principal South Wales coalfields. This notice has been given to the employers by the men, whose declared intention to terminate the agreement at the earliest possible date —namely, on the 31st of December next—was commented upon in these columns some months ago. The policy of opposition to the continuance of the sliding-scale as the machinery for adjusting wages in the South Wales collieries, has been adopted by the South Wales Miners' Federation, not because the men have any reason to be dissatisfied with the working of that machinery—which, as a matter of fact, has been beneficial to both parties during the twenty-seven years it has been in operation—but as a necessary consequence of the affiliation of the Federation with the Miners' Federation of Great Britain after the great strike in South Wales four years ago.

The proposals of the men, as submitted to their employers last November, are that, in place of the present automatic machinery for adjusting wages, a Conciliation Board of 48 members should be formed, on the lines of that which deals with wages in the Federated districts in England, provided that the rates of pay to be determined by such Board should not be fixed at less than 40 nor more than 70 per cent. above the standard rates of 1879. The great moderation of these proposals will be realized at once if we state that during the seven years prior to 1900, wages under the sliding-scale never exceeded 30 per cent. above the standard, for five out of that seven years did not exceed 20 per cent. above the standard, and for the whole period averaged 17 per cent. above the standard. In the two-and-a-half years ended the 30th of June, the wages rate has for twelve months exceeded 70 per cent. above the standard; but the maximum reached in that year was 78¾ per cent., and the average was 74½ per cent., while the average for the two-and-a-half years (which include a period of prosperity in the coal trade such as had not been known for a quarter-of-a-century) was 63 per cent. above the standard. For the period from January, 1893, to June, 1902, the average wage has been 30 per cent. above the 1879 rates. The modesty and reasonableness of the men in asking for a 40 per cent. minimum, and their generosity in offering to forego all rises above 70 per cent., are, therefore, remarkable. That the employers will not agree to maximum and minimum rates being fixed at anything approaching such figures may be taken as absolutely certain. What is doubtful is whether they will consent, without a struggle, to the supersession of the Sliding-Scale Committee, with its machinery for automatically adjusting wages, by a "Conciliation Board," involving discussion and risk of rupture over every change of wages. The sliding-scale (of which the first great advocate was Mr. Hussey Vivian, afterwards Lord Swansea, and the present principal champion is Sir William Thomas Lewis) gives to the market in Wales an element of stability, most essential to an export trade, which the owners will give up with great reluctance.

The actual giving in of the expected determining notice, after a meeting at which a proposal to defer action until the 1st of January next was defeated by a very heavy majority, renders it certain that matters will come to a head before the end of the year, and the course of events in the coming months will be watched with no little interest, not to say anxiety. The rank-and-file of the men are undoubtedly in a very aggressive mood, bred of high wages, increasing funds, and the example set by their leaders—as, for instance, their conduct and speeches in regard to the institution and carrying out of the "stop-day" policy; and he would be a rash man who would guarantee that the said "leaders" will possess the power, if they have the desire, to restrain the miners from going on strike if the settlement of the question they have stirred up be not to their liking. The impotence of these very "leaders" to enforce their wishes or commands is being exemplified at the present moment in the Merthyr district. The men at the Plymouth and Cyfarthfa collieries there are "playing," having ceased work without any notice, with a view to coercing the non-Unionists employed at those pits to join the Federation. "Mabon," the President of the Federation, and Mr. Brace, the Vice-President, have both disclaimed any responsibility for the strike, and the former at least has expressed his disapproval of it; but this has not sent the men to work again.

Another instance of the powerlessness of the Union officials when the men they have primed with denunciations of their employers, harangues about the greed of capitalists and the enormous profits of the collieries, and perorations magnifying the power of the Union and the balance at the bank, take the bit in their teeth, is afforded by the strike of 4000 men now proceeding at the pits of the Denaby and Cadeby Main Collieries in Yorkshire. Here the real occasion of the strike is suspected to be the irritation caused by the recent reduction in wages awarded by Lord James of Hereford—though the ostensible cause is an old "grievance" conveniently and suddenly revived. The men struck without notice, are not entitled to receive strike pay from the Yorkshire Miners' Federation, though they hope to get it, and have been advised by Mr. Pickard to resume work, but decline to do so. They have got a bit of money by them, the weather is fine, cricket is in full swing, and so they mean to have a holiday. Such is the British coal miner when wages are high; and the Union "leaders" have to take a back seat at such times. The men follow best when the officials are able to show increased wages as the supposed fruit of their efforts. In Scotland, the Coalowners' Association are asking for the reduction of wages to the minimum, as trade is in such low water. In the next paragraph, we are informed that, at the annual gala of the Mid and East Lothian miners, "the suggestion of the Secretary "of the Scottish Miners' Federation, that they take a fort-"night's holiday as a protest against the coal-tax, was "greeted with great applause." This is the sort of leading the men highly appreciate. Meanwhile the poor consumer watches the progress of events with as much philosophy as he can muster.

The Patent Law Amendment Bill.

THE Patent Law Amendment Bill was read a second time on Friday, and referred to the Grand Committee on Trade. Whether or not it will become law this session is a doubtful point, having regard to the state of business in the House of Commons; but there are hopes of its passing, founded on the absence of any strong opposition. Such a measure as this affects no vested interest, and therefore arouses no animosity. On the other hand, there are very few subjects of so much importance to the industrial development of the country concerning which more misconceptions prevail. The variety and persistency of popular errors respecting the assumed defective character of the English patent system and what is imagined to be the superiority of foreign patent systems are remarkable. It is possible that there are English newspapers well informed on this matter; but we could not name one off-hand that might be relied on to lead public opinion respecting the relative merits and drawbacks of the patent systems of this and other countries, from competent knowledge of the facts. And this notwithstanding the frequent publication of the special information necessary for the formation of a reasonable judgment in the matter. The general impression seems to be that stated fairly enough in the "Daily Graphic" on Saturday, which was that the American patent system is the best,

because under it every application for protection is reviewed by skilled experts, who only issue valid patents. How grotesquely inaccurate this idea is need not be explained to those who, whether to their joy or their sorrow, know something of the United States Patent Office. Besides, it never occurred to the wiseacre of the "Daily Graphic" to consider the time occupied in his admired procedure. One objection to the present Bill stated in the debate—that the proposed reforms are not sufficiently sweeping—is, in fact, a merit. Practical persons have learnt to be sceptical of what are styled "great" schemes of legislative reform, and prefer reform by some simple, intelligible, and easy stages. The present session has witnessed other projects of legislation which illustrate the principle—notably, the Licensing Bill. There is always an order of mind which asks for the drastic removal of abuses by heroic means. Nothing short of making England sober by Act of Parliament will satisfy these enthusiasts. But the judicious know better, and prefer to act by slow and sure degrees of legislative pressure. So it is with the improvement of our Patent Law. It is not so bad that it needs "root and branch" reform; while it is undoubtedly weak in several respects.

The feature of the Bill which is calculated to affect the operation of successful patents—that is, the patents in which the public are most interested—is the proposed amendment of the compulsory licence system. As explained by Mr. Gerald Balfour, in his speech on the order for the second reading, this amended procedure is to be still further improved by clauses to be moved in Committee. The Bill proposes that a compulsory licence should be obtainable on proof being given that the reasonable requirements of the public are not being satisfied by the patentee. There is a vagueness here which is not to remain. The term "reasonable requirements" is to be made to apply to the requirements of producers as well as of the consuming portion of the public, which is a great and notable extension. In extreme cases, as of "blocking" patents, in which foreigners are alleged to greatly indulge, much to the detriment of His Majesty's lieges, the Court is to have power to revoke the patent. In these cases, the onus of proving that the public interest has been reasonably met is to be put upon the patentee. There is one other change of the first importance to be made in the Bill, also in connection with compulsory licencing. As our readers are aware from our previous notices of the Bill, the jurisdiction in this procedure is to be removed from the Board of Trade, and entrusted to the High Court. This is vastly more constitutional, no doubt, for there are many and grave objections to reposing in a Government Department the power to deal with cases involving enormous pecuniary interests. The objection to the High Court is the length and the expense of the proceedings, due to the system of appeals. To avoid this, it is now proposed that the tribunal should be the Judicial Committee of the Privy Council, with no appeal. Notable as the transfer is, it is on its face a matter of administrative form; for the Board of Trade is itself a Committee of the Privy Council. The Privy Council acts only by its Committees, never as a whole. So far as the Board of Trade is concerned, the fiction of there being a Committee at all has disappeared, and the functions are exercised by the President. The Judicial Committee, however, is what the name implies. It already has certain powers in regard to patents, notably for determining their duration in the public interest (which has never been exercised) and for extending the term (which is not infrequently granted); and these constitute a precedent for making the Judicial Committee the tribunal in the matter of compulsory licences. There could not be a better choice, in the public interest.

Birmingham Glorifies Itself.

Somebody has somewhere styled Birmingham "the self-conscious city;" and certainly occasional evidence is not wanting to justify the gentle impeachment. An example in point was given last week by Alderman Clayton—whose title in the local Press is, of course, that of "Civic Chancellor of the Exchequer"—when he made his annual statement as to the Corporation finances. The indulgence of local newspapers in these travesties of the styles and titles of the National Executive, for the glorification of their pet notables, is in shocking bad taste. Moreover, it is apt to evoke various symptoms of the distressing ailment commonly called "swelled head," as we lately noticed in relation to the proceedings of the Rickmansworth Urban District Council. To call a local government body a "Parliament," merely with the object of flattering the members, is simply tempting them to make fools of themselves at some time or other; and they are not invariably proof against the temptation. As a worshipful Alderman of the City of Birmingham and as the Chairman of the Finance Committee—which is surely a good enough distinction for even so worthy a man—Alderman Clayton discoursed at large and at some length on the subject of the City indebtedness. He divided the obligations of the City into the two classes of "chargeable" and "not chargeable" on the rates. The latter comprise various municipal trading undertakings, which have cost £9,000,000 sterling, not one farthing having been paid by ratepayers in respect of this amount. On the contrary, this class of Corporation property has, during the past 27 years, paid in aid of the rates more than £1,000,000 sterling. The City has received, according to this statement, "£709,000 from surplus profits of the Gas Department, and from interest on the reserve fund £49,000, and they had been aided by the fact that gas for public lighting was sold at about half the retail rate, to the extent of £199,000. . . . Even these figures did not really fully represent all the benefit that the ratepayers had received in one way or another. . . . The Gas Offices had been built out of the profits, at a cost of £37,000, and there had been set aside from the working of the Gas Department a sum of £236,000 by making provision for gas debt in excess of the necessary contributions." And an Art Gallery has also been provided out of the gas profits. All this represents the shiny side of Birmingham municipal trading, which is the side that is turned towards the ratepayers. It is almost all made up of gas subsidies, the contributions from the other so-called profitable undertakings, including the water supply and electric lighting, being a small fraction in comparison. Profitable municipal trading in Birmingham, therefore, means selling gas at a good profit, and nothing else. It is just as well to make this clear. And it is also worthy of notice that the gas property, which stands in about a couple of millions or so, finds the only profit that can be shown on a commitment of about £9,000,000. It scarcely seems a fair division. Supposing the gas industry were really the decadent industry that some have tried to make it appear, where would then be the justification for Birmingham municipal trading?

Alderman Clayton's pleasing picture was not complete. It was alogether too much in sunshine, and was as deficient in shadows as a Chinese painting. Why did he leave out the gas consumer? We should have liked to hear him add: "And all this handsome subsidy from the Gas Department has been obtained while the price of gas has been distinctly below that which a Gas Company occupying the position of the Corporation would have charged." This was the one link in the golden chain which Alderman Clayton somehow dropped; and therefore the whole ornament is spoilt. Perhaps he can supply it. We do not for the moment infer that he cannot. Only let it be understood by all possible citers of Alderman Clayton, as an exponent of triumphant municipal trading, that Birmingham owes everything it has gained in this way to gas; and that there is no evidence as to how the gas consumers would have fared if they had not had to bear the whole burden of the municipal glorification. Possibly they feel all the better for having cleared Central Birmingham of slums and built an Art Gallery, and all the rest of it. But, at any rate, they were not asked whether they would like to do this; and even now not they, but the "ratepayers," are in the mouths of their municipal governors. Of course, if Paul the ratepayer is the same gentleman as Peter the consumer, only with another name, it does not matter.

Lord Goschen on the Incidence of Taxation.

The speech of Viscount Goschen in the House of Lords on Thursday last, on the Government Finance Bill, is uncommonly good reading. Broadly, we English are all born in the faith of Free Trade. Most of us, also, have acquired the notion that the cause of Free Trade is somehow bound up with the absence of any tax on corn. To an historical vision, the triumph of Free Trade and the abolition of the Corn Laws went together. Few could give a reasonable explanation of the faith that is more or less theirs in this regard; and fewer still would bear, without some misgiving,

the imputation that any qualifications they might admit to the logical conclusion that no article of trade ought to be taxed at all is Protection. So true is it that the world is largely swayed by phrases and names! Lord Goschen happens to be one of those ex-Chancellors of the Exchequer who have to bear the memory of having proposed a tax that they could not carry. In this respect he belongs to the majority of the order. The late Lord Sherbrooke, better known as Robert Lowe, was one of the repositories of the economic truth as it was known to Cobden, Bright, and Gladstone; and his abortive match tax killed his reputation. Lord Goschen tried a wheel tax; and it is one of the things that will enter into his immortality. When (if ever) the present Chancellor of the Exchequer is translated to the House of Lords, he will find some opportunity of talking with chastened wisdom about the taxing of cheques.

Lord Goschen deserves the gratitude of all students of a particularly difficult and most important line of economics, for explaining, in a way that leaves nothing more to be sought for, how the consumer of a taxed commodity actually pays the tax when it is too little in amount to affect the retail price of the unit in which his purchases are habitually made. It is not a question here of Protection, or of mere revenue raising; because *ex hypothesi* the amount of the impost is too small to affect the ordinary means of supply or the volume of the demand. Still, it is preferable to state the case with reference to some commodity in regard to which what Lord Goschen called the "whiff of Protection" does not arise. How would a duty (say) of 1s. per ton on portland cement be borne? It would be practically impossible to increase the price commensurately per cask or per bag; yet it is certain the consumer would in the long run have to pay it. The method of operation in this case is, according to Lord Goschen, an aggravation of the ordinary process of price raising, by which, at intervals, the manufacturer recoups himself for an increase of the cost of production. Normally, the manufacturer does not raise his prices for every rise in the cost of the materials, or fuel. or labour which he has to meet. Neither, of course, does he drop them the moment he makes a good purchase, or saves money in some other way. Adjustments of the selling price of the finished article are comparatively infrequent; and when anything has happened to permanently increase the cost of manufacture, the reductions on other accounts are withheld for a little longer. The "time lag" always goes against the consumer. This interpretation appears to be an eminently perspicuous one; and as such it deserves to be noted among those so-called laws of political economy which are in truth only respectable generalized deductions from facts of observation.

A Suggested New Competition with Gas Supply.

THE extension of the business of gas supply in London and other large towns, by active co-operation between the suppliers and the builders and owners of large office and residential property, has been a favourite theme of ours in this column. Notwithstanding the very real awakening of gas manufacturers in many localities to the altered conditions of the sales department, from the time when consumers had to go cap in hand to the counter and insist upon being placed upon the books in face of every discouragement, it is only too true that a very great deal still remains to be done in this way. Not only the prospective consumer requires to be met and gratified, instead of being dictated to, but it is becoming increasingly expedient to get beforehand with him, by agreeing betimes with his landlord. It is very certain that if the gas people will not take the trouble of doing this, others will. The current issue of the "Builder" contains a suggestive note on the opportunity now being afforded by the modern development of the "flat" system of housing in London, for establishing central stations from which hot water might be distributed for heating and for other domestic purposes. "For example, the blocks of buildings now lining one side "of Battersea Park could very easily be heated from a single "point; and if the supply of hot water for domestic use and "electric current for light and heat were also undertaken, it "is quite possible that the venture would be profitable all "the year round." This is the kind of competition in trade from which Acts of Parliament clearly do not protect a gas undertaking, and which dear gas or lax business management invite. The writer proceeds to explain that heating stations of the kind are already in operation in the United States, for the supply of hot water at fixed rates for warming radiators; and he concludes that "as the flat system is essentially of "a co-operative nature, it is strictly logical to argue that "auxiliary comforts and conveniences should be afforded in "a similar manner."

It is easy to expose the false analogy here sought to be set up between the central station house-heating undertakings of the United States, and the service of flats in the co-operative style with hot water for all domestic purposes. They have nothing in common, despite their superficial resemblance. As a matter of fact, the heating companies which still drag on a precarious existence in America do their work mostly by steam, not hot water. Really, the vogue of such undertakings was short-lived and limited; being killed in the big cities by the "sky-scraper" fashion of building blocks which are self-contained in every respect. Besides, the hot water they distributed was not suitable for baths or for culinary purposes. It is more to the present purpose, however, to dwell upon the communal needs of "flat" dwellers, as mentioned by the "Builder." It is significant that the possibilities of gas are not even remotely hinted at by this writer, yet it is certain that intelligently used gas is the best servant a dweller in a flat can have. Where is he to learn this truth? Is it anybody's business to carry on this particular branch of adult education? It is one of the questions of the hour for the gas industry.

Is there a Future for the Gas-Power Road-Carriage?

INDICATIONS are not lacking that the gas-power motor vehicle for running on common roads may be on the eve of a fresh start in the competition for the patronage of business automobilists which is fast rising to the rank of the first mechanical problem of the day. It is a very remarkable circumstance that, just when the application of electricity to the working of tramways appears to have established itself in the good graces of tramway owners, the more far-sighted mechanical engineering opinion of the day should be already inclined to look upon rail transport for highway work as on the way to be superseded by the free-running motor-car. The reason for this is obvious. It cannot pay to put down tram-rails everywhere, whatever the means of traction used. Mr. Hiram Percy Maxim has lately discussed this question in a paper from which we quote the main propositions. Considering the subject solely in the light of the growing requirements of the passenger and goods transportation service of any large town, it is plain that relief can only be had from the tireless, fast-running, mechanically propelled vehicle, independent of fixed tracks. Modern cities have already extended themselves over areas so large as to make the irregular and occasional conveyance of passengers and merchandise over them most difficult. Electric tramways, so far from relieving the trouble, daily increase and aggravate it. What is wanted is a fast distribution service running from shops to purchasers' doors.

Already in many localities there are experimental express motor parcel delivery ventures, the success of which will revolutionize the town and suburban transportation system. The horse cannot do this kind of work. It would run him off his legs in no time. The institution of the delivery "round" is the foundation of horse transportation; but this system will be abolished by the motor-van, which does not mind how often it goes over the same ground. "Cripps the "Carrier" is come to his own again, but with a difference. While the separation of heavy goods traffic from the passenger service will still be found convenient, light parcels and passenger transportation will once more be handled together, only at speeds and with a frequency of journeys to which the carrier's cart was a stranger. Mr. Maxim thinks that possibly the electric automobile will readily find employment in this kind of town carrying work, because of the simplicity of the driving. "As far as reliability goes, we might "say that electricity is almost fool-proof." But as soon as the gas-motor is so simplified as to require no more skill to drive than the electromobile, its cheapness will drive every other road machine out of the market.

If coal gas could be compressed to about the same calorific strength for bulk as petrol, it would be far preferable. Here is the difficulty. Road-motors are of anything from (say) 5 to 30 horse power. How carry the necessary quantity of gas for a single day's run? Compression up to 20 or 30 atmospheres would be the only way; and this introduces another element of risk. Mr. Maxim does not see a chance

in the new express service for steam. The point is, for the moment, that the motor vehicle is qualified to supersede most other means of road transport, including the electric tramcar, from doing that general work of carrying passengers and parcels in city and suburbs which is growing in magnitude daily. It is a purely business need. When the manufacture is perfected, for one pleasure vehicle of the kind there will be a hundred upon the road for hard work; thus reversing the present proportions of the trade. Automobile road racing is only a phase which will quickly pass away.

The Disposal of Gas Profits at Coventry.

The question of the disposal of the profits realized on the working of the gas supply undertaking of the Coventry Corporation in the past financial year was the prominent feature in the discussion which took place in the City Council last Tuesday. The amount realized was not large, for a make of nearly 600 million cubic feet of gas (an increase of 6½ per cent. on the preceding year), for it was only £2459, of which £989 was bank interest; and the Gas Committee recommended the Council to strengthen the reserve fund by the addition of £2000 to it, and carry forward the rest. This proposal had the support of the Finance Committee, but it was objected to by those councillors who regard the reduction of the rates as the primary object of a corporation undertaking, whatever may be its nature. Since the municipalization of the gas-works at Coventry about eighteen years ago, they have fulfilled this object to some tune; for no less a sum than £36,614 has been handed over in relief of the rates. From 1896-7—the "boom" year in the cycle trade—till 1899-1900, £4000 was regularly transferred from the cash-box of the gas undertaking into the channel which many regard as the only legitimate one. But since then nothing has been available, and the prospects for the current year, though fairly bright, are by no means brilliant. This dreadful position shocked certain members of the Council, who clamoured for the appropriation of £1000 of the profits, and the raising of the price of gas to make them larger. But the latter suggestion was scouted, and the former negatived by a very decisive majority. The reserve fund will consequently be increased to £7000—not an exorbitant amount, it must be acknowledged, on a turnover of £90,000, and in view of the chances of a total or partial change of manufacturing site. The undertaking is just now in rather low water; and consequently Mr. Fletcher W. Stevenson, the new Gas Engineer, will have plenty of scope for the exercise of his managerial ability in raising it to its former position. We look forward confidently to next year's report being much more favourable than the one just presented.

The Increased Gas Bill Epidemic.

Of late the air has been laden with complaints of mysterious increases in accounts rendered for gas which has been consumed —or, as the discontented ones urge, which has not been consumed. The Town Councillors of Perth have found it necessary to call in no less a person than Mr. Thomas Newbigging to report upon the matter; while in Manchester a doctor has allowed himself to be hailed before the Magistrates rather than pay for gas which (in spite of the evidence of the meter) he believed could not possibly have been used. Another place to which the epidemic has spread is Salford, where the matter has given rise to a considerable amount of newspaper correspondence. At the meeting of the Borough Council last week, one member asked if the subject could not be investigated by a gas expert; while another wanted to know if it would not be well to have an inquiry as to whether the meter-index, and the meter-index alone, was to be relied upon, or whether it was not possible that something might move the index-finger "apart from the pressure of gas." The answer of the Chairman of the Gas Committee was short, but it was to the point; and it is to be hoped the consumers will bestow upon it at least as much attention as they would give to a long-winded tirade in the local Press over the *nom de guerre* of "A Victim" or "An Indignant Consumer." The reply is applicable not only to Salford, but to all places where similar grumblings exist. The Chairman commenced by explaining that, whether it was coal gas, water gas, or oil gas which passed through the meter, it was registered just the same; and a cubic foot of one was a cubic foot of the other. One fact the public would not look at was that, whenever the weather was dark, foggy, or cold, people found it easy to turn on their gas-tap, whether for the sake of light or heat; and afterwards they forgot all about this circumstance. A comparison was made between the corresponding periods of successive years; but the weather did not necessarily repeat itself in those periods, and hence the meter did not repeat itself as a record. He concluded by denying that the meter could be influenced by any other means than the gas which passed through it. Here is the whole case in a nutshell. How simple a matter it is, and yet how difficult to get people to appreciate. A gas consumer is almost as hard to convince against his will as is a woman against hers; but the lucid statement of the Chairman of the Gas Committee should go a long way towards "laying the ghost" in Salford at any rate.

A Successful Water-Gas Plant.

An opportunity was afforded Mr. John Carter, at last week's meeting of the Lincoln City Council, of placing before the members some interesting facts in connection with their carburetted water-gas plant; and what he was able to put forward must have completely dispelled the doubts which were entertained by the Mayor as to whether the citizens had benefited by its introduction. The cost of manufacturing water gas of 18½-candle power has in the past twelve months been 3d. per 1000 cubic feet less than it was possible to make 17-candle coal gas for. From a financial standpoint, therefore, the system is clearly a success. Mr. Carter, however, remarked that the main objection to water gas in some quarters had been with regard to its use for power; and in this connection he pointed out that the commercial value of water gas, if employed alone for power purposes, was 5 per cent. below that of coal gas, which would make the difference at Lincoln (where 30 per cent. of water gas is never exceeded) not more than 2 per cent. This is, of course, a trifle compared with the saving in the cost of manufacture, though it must not be forgotten that the past year was a favourable one for water gas, as compared with coal gas, inasmuch as both coke and oil were cheap. Even if the cost of these materials should rise, there will still be the very much smaller capital expenditure incurred on its installation, as against what would have been necessary to extend the coal-gas works, to be reckoned in favour of the carburetted water-gas plant.

Results at Edinburgh.

The accounts just published of the Edinburgh and Leith Gas Commissioners show that, for the year ending May 15 last, there was a surplus on the working of £11,169, which compares with a deficiency in the previous year of £11,536. The net balance is £2753, which may be increased by £3176, should the Commissioners resolve to avail themselves again of the right of suspending the sinking fund contributions for the expenditure on the Granton works. The Treasurer (Mr. J. S. Gibb) regards this result as being satisfactory; and he points out that the revenue from gas increased by £10,309, while there was the very substantial decrease of £24,200 in the cost of coal, oil, and other manufacturing charges. The income on revenue account amounted to £327,556, and the expenditure to £256,869; while the capital outlay at Granton during the twelve months was £210,698, making the total expenditure so far incurred on these works £498,296.

Cost of Power for Working Tramways.

The proceedings at the twelfth congress of the Tramways and Light Railways Association and the International Tramways Union which was held at the Agricultural Hall last week had a certain amount of interest for our readers from the fact that one of the items on a very full programme—comprising the reading and discussion of a number of papers and visits to works—was a report specially prepared by M. Charles Thonet, Engineer and Manager of the General Contract Company of Liége, on the cost of central stations and the production of electrical energy. He was requested to present to the congress some technical information in regard to the equipment of central stations, including the efficiency of boilers, steam and gas engines, dynamos, and stationary batteries, and to give some indication of the actual cost of electrical energy generated for

traction purposes, as recorded on the switchboard, when the current is furnished by steam, producer gas, and hydraulic power. The author was forced to resort to the "inquiry-circular;" and the result was not so satisfactory as he hoped it would be. He nevertheless was able to supplement the replies received by some personal information; and he succeeded in framing an interesting report, some extracts from which will be found in another column. It will be seen that the cost ranges between 4c. and 10c. per kilowatt-hour. The highest figures (8c. to 10c.) are for small stations operating engines of 100 to 200 horse power, with coal at 15 frs. to 20 frs. per ton. In a producer gas station, however, with fuel at this price, the cost would range between 4c. and 6c., or the same as it would be in an important station where engines of 1000-horse power and upwards are in use.

Enrichment by Benzol.

That prolific contributor to French gas literature, M. A. Lecomte, appeared before the members at the recent meeting of the Société Technique du Gaz with two papers. The first was noticed last week; and the second, which deals with the enrichment of gas by benzol, is published in the present issue of the "JOURNAL." The greater part of the communication is a description of two installations of apparatus employed in the process of enrichment by benzol; but perhaps more general attention will be given to the results of tests made over a period of five months' working in winter, than to the explanatory matter. Experience is so contradictory, that it is interesting to learn from such a careful observer as M. Lecomte that, during the period mentioned, naphthalene was almost completely kept down with from 3 to 5 grammes of benzol per cubic metre; and that as much as 30 grammes of 90 per cent. benzol per cubic metre can be taken up without any noticeable abnormal behaviour of the ordinary or incandescent burners. He also states that the output of gas can vary 40 per cent. without alteration in its illuminating power; benzol proportional to the volume passing being, of course, introduced. Mention of these two or three points may induce benzol users to examine with care the construction of the apparatus illustrated and described elsewhere.

The Nernst Lamp as a Competitor.

At last the Nernst electric lamp should be on the road to fame and fortune; for it has been decided to adopt it in place of gas for the lighting of the principal streets—at Colchester. The intention is to substitute 150 Nernst lamps for the same number of gas-lights, at an initial capital outlay of £450, and an increased annual expenditure of £170. This seems a tolerably heavy price to pay for what, after all said, must be admitted to be to some extent an experiment. The principal part of the capital expenditure will be upon cable connections and switches; for the lamps themselves cost only 15s. each, and the mantles 1s. 6d. apiece. The Committee who recommended the adoption of the system are perfectly satisfied with the life of the lights; but should they prove to be mistaken in this respect, the mantle renewals—even at 1s. 6d. each—may materially alter the financial part of the scheme. In the course of the discussion in the Town Council, of course, gas came in for a good deal of abuse, though one member, who denied that Colchester was at all badly lighted, made the very significant assertion that, if the present lighting required any improvement, "they knew perfectly well it might be done without any addition to the cost at all." In view of this statement (which apparently was allowed to pass uncontradicted), it is, spite of the indignant denial of the Chairman of the Committee, impossible to avoid thinking that the fact of the electric light undertaking being a municipal concern had something to do with the decision arrived at. At any rate, this £170 a year will greatly improve the annual balance-sheet. One of the local papers admits that any great extension of electric street lighting cannot be expected for a long time, as the cost is too great to justify its adoption in any except the streets most centrally situated; but it is added that when the smaller householders use the electric light in their cottages, the street lighting will become a matter of course. If it depends upon the cottagers generally adopting electricity, the total banishment of public gas lighting from Colchester is still a remote contingency.

WATER AFFAIRS.

Liverpool and its Water Supply.

WHEN, a few years since, the Corporation of Liverpool resolved that their Water Engineer (Mr. Joseph Parry, M.Inst.C.E.) should present an annual report upon the works under his charge, they achieved a twofold object for which they deserve the thanks of others besides the ratepayers and consumers of the city. In the first place, they enabled him to show the progress of an undertaking which is generally cited when it is desired to enforce the advantages of placing the water supply in the hands of local authorities; and, secondly, they afforded him an opportunity for bringing forward points of technical interest which might be valuable to his professional colleagues. His third report, some extracts from which are given in another part of the "JOURNAL," furnishes abundant proof of his desire to carry out his instructions to the fullest extent. He deals first with the quantity and next with the quality of the water supplied to the city; being assisted in the latter connection by Professors Campbell Brown and Rubert Boyce. It is gratifying to find that, notwithstanding the deficient rainfall which characterized last year, not only was a full constant service maintained over the entire area dependent upon the Liverpool works, but during the summer a temporary supply was furnished to Oswestry, which suffered, in company with many other places, from the extreme drought. The total amount of water delivered, including compensation, was 17,151,469,000 gallons, compared with 16,312,075,000 gallons in 1900; the quantity used for domestic purposes, including waste and leakage from pipes and fittings, being 5,521,185,000 gallons, against 5,466,490,000 gallons in the preceding twelve months. The domestic supply was at the rate of 18 gallons per head of the population, which increased last year by 11,728 in the compulsory area. The entire bulk of water was procured mainly from Lake Vyrnwy and Rivington—45·58 per cent. from the former, and 41·15 per cent. from the latter source; while the rest was drawn from wells. With regard to quality, the bacteriological examinations made by Professor Boyce of samples of water taken daily from a public drinking fountain showed an average of 23 bacteria per cubic centimetre throughout the year.

The foregoing matters occupy the first half of the report; the second being devoted to a subject which has given Mr. Parry trouble almost from the first turning on of the Vyrnwy water to the city. It was found that the quantity of water discharged through the pipe between Vyrnwy and Oswestry was very much less than that which went through the portion connecting that town with Prescot, though the output should have been as nearly as possible equal. The discrepancy was at first attributed to the effect of accumulations of air at certain points in the aqueduct; but the combined labours of Mr. Parry and Professors Brown and Boyce revealed the existence of a ferruginous fungus which not only discoloured the water, making it look like weak coffee, but has grown so persistently as to considerably reduce the capacity of the pipe. According to Professor Boyce, the fungus grows in certain parts of the watershed, and fragments are carried with other *débris* into the lake, and pass through the strainer into the aqueduct, where they gradually collect at the sides, and form a coating on the brickwork, wood, or iron of the pipe. The gelatinous nature of these fragments facilitates their adhesion, and they entangle all kinds of other *débris*, such as sand, diatoms, &c. With age, the lower layers of the deposit appear to gradually become more compressed, and to lose all resemblance of fungus origin. A curious feature of the deposit was that, when it was removed by brushing, it seemed to grow with renewed activity; and in eighteen months it caused a drop to the extent of 2½ million gallons in the delivery. Mr. Parry has come to the conclusion that no chemical treatment of the water is necessary, but rather a well-devised scheme of combined screening and filtration, so that the water may enter the aqueduct in such a condition as not to favour the growths complained of. Moreover, recent improvements in the appliances employed now enable the brushing operation to be carried out more speedily than of old. Already filter-beds have been provided at Oswestry; and Mr. Parry has prepared a scheme for their extension, so as to deal with the whole of the water to eventually be drawn from Vyrnwy.

ESSAYS AND REVIEWS.

THE BEGGING SYSTEM.

When engaging—in the "Journal" for May 27 last—to lend the assistance of these columns for the suppression of the pernicious system of begging to which trading firms connected with the gas industry are subjected by men of almost all degrees in the service of gas companies and gas-supplying authorities, it may be confessed that we hardly expected to receive so much positive evidence as has been forthcoming of this disreputable and underhanded system of extortion, and, be it noted by those who sink to these acts of meanness, from the traders and contractors themselves. It is perhaps unnecessary to point this out, excepting for the purpose of bringing home to those who practice this form of (one could almost call it) blackmailing, the truth that the veil that shields them is an extremely thin and fragile one. The communications are clear proof that some representative firms resent this fleecing by employees of their customers, and that others, who complaisantly comply with the demands made upon them, are conscious that their part is not altogether chaste, and would gladly be released from further participation in the offensive transgression of right.

But it is pointed out that the total suppression of the evil can only come from the side of those who have commercial relations with gas suppliers, by their combined action; and this is a difficult phase of the question. While two or three firms in one line of business persist in meeting the demands made upon them by subordinates, and (sad to say) in some cases by superiors, of gas undertakings, other firms cannot well hold their hand if they desire to retain the goodwill of those who have influence in the placing of orders. We have evidence which proves that in some cases the fact of a firm refusing to contribute to workmen's beanfeasts and outings has not only told greatly against orders for new goods, but has led to innumerable petty complaints in regard to goods already supplied—all out of sheer maliciousness, because the firm declined to be dunned. But against the continuance of such a system an honourable compact ought not to be out of the question among honourable men. Concerted action in regard to certain percentage increases in price has not been found an impossibility in bygone times, and why should association in opposition to a system which is unfair alike to the traders themselves and to their customers, and which tends to undermine more and more the purity of commercial relations? Of course, no one can shut his eyes to the fact that, after all, the gas trading community—and more particularly two or three sections of it—have only themselves to thank for the extent of this rancorous growth. It is their mistaken lavishness in the past that has propagated the mischief; and it is well—now that the system has reached for the manufacturers an almost unendurable length—that it should be recognized that, where the root of the evil rests, there is the best place to strike at extirpation. Exposure in the "Journal" may help in suppressing the nuisance; but at the best what we can do, and what the superiors of gas undertakings can do, will give them but partial deliverance.

Reverting, however, to the original article on this subject, it was suggested by the receipt from a firm of manufacturing engineers of a begging letter for a beanfeast, which letter had emanated from a Corporation Gas Office. Another firm now tells us that during the season such letters are of weekly—aye and of almost daily—occurrence. But a worse form of begging letter than that the proceeds of which are for collective entertainment, is the personal one. Clerks who are about to go on their holidays are suddenly overcome with such large heartedness that they must needs write and wish suppliers of gas-works necessaries "the compliments of the season"—just mentioning, quite incidentally of course, that they are going to spend their annual vacation at Mudgate-on-Sea. Men about to get married, too, are so exuberantly happy that they are convinced that not only must their immediate friends be made cognizant of the joyful event, but that those who enjoy their master's custom will experience the keenest pleasure in receiving the intelligence. Occasionally hints as to approaching silver weddings find their way into the manufacturers' capacious letter-boxes. Makers of gas-works appliances are also suspected of having very fine ears for music; and so they are only too gratified to be afforded the opportunity of purchasing a dozen or two reserved seat tickets for a concert held perhaps the other end of the country. Not being credited apparently with having anything of the kind to support in the immediate neighbourhood of their residences, it is commonly believed that they are only too glad to learn where donations can be sent to charitable institutions elsewhere. Gas-works cricket and football clubs also invite their gracious patronage; and even subscription lists in connection with the Coronation celebrations were considered fit grounds for appeal. Why? Will some who have sent such begging letters answer, and append their names for publication?

But the following from a circular which has come to hand caps everything we have seen in the way of solicitation for money:—

Dear Sirs,—Mr. ——, who has been Manager and Secretary of these works for the past ten years is now leaving to undertake a similar post at ——. During his term of office here, he greatly improved and enlarged these works, virtually reconstructing them, whilst he also largely increased the value of the concern from the shareholders' point of view, having for the past six years regularly paid the maximum dividends (which had never been done in the history of the Company before his advent), and doubled the market value of their holdings. It has been suggested by a number of his friends, and by others who have so largely benefited by the works he has carried through, and by the results which have attended his management, that he ought not to be allowed to depart without some token of appreciation of his work here; and I have been deputed to invite you to help in the movement thus inaugurated for presenting him with a suitable testimonial.

This cool invitation for subscriptions (which by the way was printed, and so no doubt had a decent circulation) was signed by the son of the man to whom the "suitable testimonial" was to be presented! With the difference that a son has not begged for his father, we have known of similar happenings in connection with larger works; but it is earnestly hoped that head and other gas officials will in future refuse to receive gifts of any kind the purchase of which has been made possible by a subscription canvass outside those above or with whom they have worked. What intrinsic value can attach to such a gift, purchased largely by outside aid, as a memento of the regard and good feeling of one's fellow workers or staff? In many cases the greater part of the intrinsic value of the gift endures just so long as the recipient is able to influence orders for the contributors.

EFFECT OF HOLIDAYS AND ILLUMINATIONS ON GAS CONSUMPTION.

There is much ignorance abroad as to the actual effect that public illuminations have on the consumption of gas. We find evidence of it in the Press, among lay acquaintances, and even among some of the gentry of the Stock Exchanges, who appear to be credited with a supernatural power of penetration, and so able to forecast the result of the movements of men and things. Only a few days since, a financial writer in a daily newspaper attributed the fact that there had not been a set-back of certain gas stocks in view of the postponement of the Coronation illuminations to the belief that was current that the benefit which would accrue therefrom had only been briefly deferred. Of course, this public ignorance is not shared by any connected with the management of gas undertakings who had experience of the illuminations at the time of the jubilee and diamond jubilee of Her Majesty the late Queen. Mr. Henry Woodall, writing with his experience to support him, recently stated in the "Journal" that he expected the Coronation illuminations would not lead to an abnormally large demand for gas. "I shall," he added, "be greatly surprised if in towns of any size—and London more particularly—the demand exceeds that of a Sunday. These illuminations are very imposing in main thoroughfares and particular centres; but they hardly compensate for thousands of houses left tenantless and dark."

Mr. Woodall here hit the mark; and so far as a test has been applied, his prognostication has been fulfilled. But, in addition to the numberless dwelling-houses left "tenantless and dark," the recent double bank holiday (although the Coronation is not yet, through the regrettable circumstance of the King's illness) accounted, all arrangements having been made, for the closing of most large manufactories and business premises during the latter half of the week ending on June 29; and this would represent a not inconsiderable decline in the day-gas consumption. Then, again, temperature as Mr. W. Doig Gibb reminds us in a personal letter (accompanying some figures with which he has favoured us) plays a not unimportant part in the returns; and, on the day of the illuminations in Newcastle this year, the temperature was 84°, as compared with 59° this time last year. But the fact that he obtained an increased consumption on the day of the higher temperature (with the illuminations) as compared with the corresponding day last year which was colder and without illuminations, show that the circumstances of the corresponding day of last year were not normal. Newcastle, in fact, is not a fair guide, as the week with which we are particularly dealing is "race" week there; and it is the principal holiday in the year of the local workmen. It goes without question, however, that temperature would have its effect on the station meter records; and, in London, on June 27 and 28 the days were dry and hot. Furthermore, in considering the effect of the illuminations upon gas consumption, the increasing use of electricity for the purpose has to be taken into the reckoning; and the streets of London bear evidence of a very considerable adoption for illuminative decoration. These are all factors of which the layman has little or no knowledge, and therefore does not make allowance for when he asseverates, with all the assurance of a vain-pretender, that the "illuminations will be a fine thing for the gas companies, and will make the wheels of the meter-recording mechanism spin round." Of such is the writer in the "Pall Mall Gazette" who said on June 28: "One may gather some idea of the extent to which Coronation preparations had been made by observing the reservoirs [*sic*] at the different gas-works around London—at Battersea, Kennington, Blackwall, and elsewhere. They all stand at a high level of inflation, and

instead of working at extra pressure, as intended, the staffs are at present comparatively idle. A maximum reserve of gas is inadvisable at this season of the year; and it will be steadily worked down unless some general illuminations are projected soon, so as to celebrate the King's recovery." We quote this paragraph as an example of newspaper sapiency on this subject, and for the amusement it will afford readers.

In London there has not, at the time of writing, been a general lighting up of the illumination decorations; but in view of the King's rapid recovery, the projected arrangements for the Coronation rejoicings have been carried out in many places in the Provinces. These have enabled us to obtain a few interesting figures, which conclusively show that, owing to the holidays, and the consequent smaller consumption of gas for business and household purposes, the actual output of gas—illuminations notwithstanding—in all cases but one, was less than on the corresponding dates of last year. Other figures, too, where there were no illuminations disclose a substantial relapse in gas consumption which can only be attributed to two causes—the holidays and the high temperature prevailing. In this latter category, we may take as an example the Gaslight and Coke Company, the figures in regard to which were kindly supplied by Mr. J. W. Field. On Thursday, June 26, the consumption was 36,250,000 cubic feet; and on the following day, it was 34,665,000 cubic feet. The outputs for the corresponding days of last year were 41,454,000 cubic feet and 41,558,000 cubic feet. The approximation of the figures for the two days of last year show that the consumption was then taking a normal course; while the drop in comparison for the two days this year clearly reveal that there were abnormal causes operating against the consumption. Those causes were produced by the pause in business; and there was no partial compensation from illuminations. It will be interesting, when there is a general illumination of London, if Mr. Field, Mr. Jones, and Mr. Carpenter will furnish their returns for publication.

Judging from the figures received, the experience of London has been that of most other cities and towns of importance in the country. Birmingham, which is a striking example, may be taken first. There, as in many other places, the favourable bulletins as to the King's health, decided the authorities to observe with rejoicing the holidays which had been irrevocably preappointed; and the illuminations were carried out with the full splendour arranged for. Although gas was the chief illuminant, Mr. G. Hampton Barber, the Secretary of the Gas Department, informs us that the consumption on June 26 was only 6,791,000 cubic feet, and the next day 6,818,000 cubic feet. The corresponding days' outputs in 1901 were 11,641,000 cubic feet and 11,750,000 cubic feet; so that Birmingham—taking the two days together—exhibits a reduction approaching 10 million cubic feet. Figures, which have Mr. William King's authorization, disclose a like story in regard to Liverpool. The holidays were largely observed so far as work was concerned; but we believe that there were illuminations only on the second day. On the Thursday, the consumption was 3,883,000 cubic feet, and on the Friday 4,716,000 cubic feet; while the figures which Mr. King is able to oppose to these for the same days last year are respectively 5,210,000 cubic feet and 6,532,000 cubic feet.

Then we come to the statistics for Newcastle; and there the holiday question does not affect the gas output with the same severity as in most other places, for the reason already mentioned. The figures for Thursday and Friday and the corresponding dates last year have, in consequence, a closer relation; and those for the Saturday, also comparing with a workman's holiday last year, are better than those for the same day of 1901—the improvement presumably being due to the illuminations which were carried out on the Saturday. The outputs were: On June 26 3,677,000 cubic feet; June 27, 3,911,000 cubic feet; and on June 28, 5,000,000 cubic feet. The output for the same days last year were: 3,913,000, 4,291,000, and 4,516,000 cubic feet respectively. Mr. Gibb has sent with his figures the temperatures registered at 10 a.m.; and, as he points out, they are of interest. On June 26, the temperature was 55°; the following day it was 71°, and on the Saturday 84°. The comparative temperatures for last year were 66°, 72°, and 59°. While the Newcastle figures do not go so directly to the point that this article is intended to clearly show, they help to that end when all the circumstances are considered. The illuminations at Sheffield were on a comparatively small scale, as some of the largest shopkeepers requisitioned the Lord Mayor not to ask them to spend money in this way, as they thought it could be devoted to some better object. However, Mr. Hanbury Thomas has kindly looked up the statistics for the days of the jubilee and diamond jubilee of our late Queen. He finds that on June 22, 1887, there was a decrease of 11·35 per cent. in the consumption of gas as compared with the corresponding day of the previous year; and on June 22, 1897, the decrease was 19·97 per cent.

Running over to Dublin, it is found that the illuminations were in full swing on Monday and Tuesday last week; and Mr. F. T. Cotton tells us that the gas issued those two nights amounted to 2,228,000 cubic feet and 2,286,000 cubic feet. On the corresponding nights of 1901, the outputs were 2,894,000 cubic feet and 2,486,000 cubic feet. Here again, illuminations notwithstanding, there are fairly substantial relapses. Then getting across to Wales, we learn from Mr. Henry Morley that on June 26 the consumption was for the twenty-four hours 1,200,910 cubic feet, and on the following day 1,205,490 cubic feet. The comparative figures for 1901 are 1,503,120 and 1,434,640 cubic feet.

ELECTRIC LIGHTING MEMORANDA.

The Meeting of the Municipalized Electricians—Mr. J. H. Rider's Address—What is the Saving of Combining Electric Lighting and Tramway Traction?—Book-Keeping and Popularity-Hunting—Lieut.-Col. Crompton's Views.

THE Seventh Annual Convention of the Incorporated Municipal Electrical Association was held in London last week, under the presidency of Mr. J. H. Rider, the Electrical Engineer to the London County Council Tramways Department, who read an interesting and informing address dealing largely with a subject that has recently been ventilated in these columns—the working of tramway traction and electric lighting systems in combination. So long ago as 1896, when Mr. Rider was holding another and less conspicuous appointment, he advocated the combination on the score of economy; and he now excusably plumes himself somewhat upon having been the prophet of the new dispensation. It is almost a pity that circumstances at present debar Mr. Rider from exemplifying in his practice the advantages of the system which he so greatly admires. How splendid it would be if the London County Council could make the tramway passengers pay for a good supply of electric light, or draw upon the electric lighting of London to help pay the expenses of the electrified tramways! We are not sure which is the proper municipal aim. Something is to pay for something else, at any rate; and that is the golden rule of municipal finance.

Yet it is at least conceivable that to some extent the combination of electric lighting and tramway traction ought to be an economical arrangement. Precisely what savings can reasonably be expected from such a combination is a detail for which we have searched Mr. Rider's address through, in vain. True, he cites as examples two towns—one with a combined system and one with lighting only; and he shows that the former realized a profit, while the latter made a loss on last year's working. But, of course, almost anything could be proved in this way, if proof it can be styled. We observe, with modest satisfaction, that our difficult contemporary the "Electrician" is equally dissatisfied with the quality of Mr. Rider's proof. It is well remarked that there is a third step in the argument to be supplied—evidence that a tramway business can do better when linked with a lighting connection than when running alone. We venture to opine, in the meanwhile, that no such evidence exists, or is likely to be forthcoming. It is one thing, and quite "municipal," to plough with an unequal team, and quite another thing to make sure that the partnership is mutually advantageous.

The world will never get to the bottom of these questions of municipal electric lighting and tramway traction economics until the authorities keep their accounts properly and separately, and let the public see precisely what every service costs. What we have so frequently complained of in regard to this matter is the invincible reluctance of most local authorities to let the ratepayers know the exact truth. It may be good policy in a particular place to subsidize the electric tramways out of the electric lighting, or *vice versâ*; but at least let the fact be confessed. Until, and unless, this is done, municipal trading combinations will always be suspected. The temptation to play for popularity is so great that few town councillors in a position to pose as public benefactors are able to resist it. They may affect to do so; but somehow the halo is furnished for them, at the right time, by their electoral associations, or by the kind offices of a friendly paper.

Unfortunately, Mr. Rider was not content to stick to his own trade; but must needs avail himself of the opportunity afforded by his occupancy of the chair of the Municipal Electrical Association to pronounce an opinion upon a matter which does not fall within his competency to judge with any claim to special respect. He said that, "in his opinion," the abandonment of the overhead trolley-wire system of tramway traction for any other, "merely for æsthetic reasons," is not justifiable. This is how electricians have got themselves disliked. Who made Mr. Rider a dictator in æsthetics? He may know all about trolley-wire traction; but this expertness no more qualifies him to express an opinion as to where the trolley wire is or is not tolerable having regard to the amenity of a locality, than it would to design a cathedral. Everybody knows where this arrogance comes from, in the present instance. It is from Spring Gardens, whence originate the plans for festooning Westminster Bridge, the front of the Houses of Parliament, and of Westminster Abbey, with the neat and tasty trolley wire arrangements which are so universally admired. There is no room for misunderstanding on this head. Mr. Rider lays it down that the abandonment of the trolley-wire system in favour of the conduit system is only justifiable when the traffic over the lines is so great that the heavy capital charges do not make any serious addition to the cost per car-mile. He mentions other considerations of the same order. Nothing but the crassest, crudest economical principle is to be regarded. And yet some electricians profess astonishment that anybody should object to their dictation in respect of everything that may appertain to the life of English towns!

Happily, all electricians are not of the same drab utilitarian "stripe." Besides, there are those who see farther into the perspective of the future than the vista of a road lined with "neat, and even artistic" trolley posts. Among them is Lieut.-Col. R. E. Crompton, who has had occasion to protest against an

accusation of unfaithfulness to his salt, because he opposed the laying of a trolley wire tramway across Hammersmith Bridge. The letter in which this defence appears, in the current issue of the "Electrician," is at once an indictment of the propensity of electricians to run after the cry of the moment, and a statement of the grounds upon which the tramway, electrical or other, must be judged an imperfect solution of the problem of town communications. This is not the time for creating unnecessarily yet another vested interest, to help to bar the way of mechanical progress. Lieut.-Col. Crompton believes that in the free-running motor-car, preferably electric, will be found complete solution of the problem in question; and he objects to seeing main roads delivered over to tramways which have the effect of impeding, rather than of facilitating traffic. But how can motor-cars be ever municipalized? There's the rub. For everything which is not municipal is accursed, in the eyes of some people.

THE QUESTION OF BOILERS AND STEAM FUEL.

(*Concluded from p.* 20.)

THE doom of the cylindrical boiler was sealed when it came to be realized that steam for power purposes might as well be used at an initial pressure of 200 lbs. or thereabouts, as at the middle-Victorian 50 lbs. Those members of the Southern District Association of Gas Managers who lately went to see the Hampton pumping stations of the London Water Companies, had an opportunity of witnessing the whole progression. Steam quietly and gently generated to 50 lbs. pressure in plain Lancashire boilers, mechanically stoked and never driven beyond their normal gait, is in the oldest engines used expansively—say, sixfold—in single-cylinder engines, condensing. Nothing could be nicer than this easy-going work. No smoke; no serious wear and tear. The plant might last any length of time with good care; but it could do no more. A different type of plant altogether is required to secure the advantage of a doubled steam pressure—an advantage procurable, it is hardly necessary to remark, for a very little, if any, additional consumption of coal. This means strengthened boilers, and steam-engines fitted with high and low pressure cylinders. Yet this advance represents but a middle stage of the development. The boiler pressure is nowadays doubled again, making it 200 lbs.; and the steam is expanded three times, with the condenser for a finish. But the plant has to be altogether different. The cylindrical boiler has disappeared, and its place is taken by the water-tube boiler, with economizer, superheater, and fan for intensified draught. And the change is for safety and ease of working.

As to economy of fuel, the question really resolves itself into a matter of furnace construction and working. There is reason to believe that the ingenious men who have hitherto worked at the water-tube boiler were no pyrologists. They were, and some still apparently are, profoundly ignorant of the true principles of the burning of fuel for heating purposes laid down by Mr. Frederick Siemens so long ago as the date of his patent No. 5677 of 1883. Siemens specified that furnaces should be so constructed and worked that the flame of the fuel should be kept entirely clear from the objects or materials to be heated, and as much as possible from the furnace walls, and that the whole of the heat should be obtained by radiation from the flame itself and from the roof and walls of the furnace chamber, heated by radiation from it. Nothing could be simpler or clearer than this rule, which reposes on the observation that when a flame impinges on objects colder than itself, or obstructing it, the combustion is rendered imperfect, and consequently there is considerable waste of fuel. Those who know most of the furnacing of water-tube boilers can form their own judgment as to how far this principle has been acted upon in this connection. The natural idea as to the proper way to heat an object is altogether different. Common sense would appear to suggest the propriety of putting the substance to be heated in the hottest part of the fire; and this procedure has been followed in very many examples of industrial firing (including the heating of gas-retorts), only for it to be discovered, by means of the fuel account and a flaring chimney-top that it is wrong. Thus it came to be understood that a large combustion chamber is of the essence of a good and economical retort-setting.

We desire to record appreciation of the good work done in the elucidation of this and other considerations relative to the subjects of burning fuel to the best advantage, and communicating its heat to the objects presented for the purpose—which are two distinct divisions of the science of pyrology—by our contemporaries the "Engineer" and other technical journals. There was a most instructive and suggestive article in the journal named for May 30, entitled "Steam." It was written on a text furnished by a paper of Mr. Stromeyer contributed to the last meeting of the Institution of Naval Architects, which is well worthy of the particular study of mechanical engineers. Discussing the phenomenon of the ebullition of steam, our contemporary lays stress upon the fact of observation that the actual disengagement of steam from heated water is provoked by a sort of physical catalytic action, if such an expression is permissible That is to say, ebullition in a mass of water begins, and may afterwards be more strictly confined than we know, to some small prominences of the heat-communicating surface. "In iron or copper boilers, small projections or roughnesses in the surface of the metal constitute ebullition centres. Comparatively large boilers have been fitted with glass ends for the purpose of observing what goes on inside; and it has been found that the whole heat passing into the boiler from a large gas-fire, consisting of rows of bunsen jets, has ostensibly been concentrated in one or two spots not larger than a sixpence, from which an enormous volume of bubbles rose to the surface in a continuous stream." Everybody has witnessed the same phenomenon in the boiling of clean water in a clean vessel.

Working upon this indication, Wye Williams long ago took out a patent for fitting boilers with "heat pegs," as he called them; being numerous studs of copper, 1 inch in diameter and 6 inches long, stuck through the bottom plate of the boiler, so as to project both into the water and into the furnace gases or fire. The idea was to increase the capacity of absorption and transmission of heat. The theory was right, as Péclet showed later; but practically the device failed and had to be given up, because the pegs inside the boiler became rapidly coated with scale which could not be removed. The outer ends then burnt off. This failure did not detract from the value of the principle involved; and, as our contemporary remarks, it is the principle of the Serve boiler-tube, and of all flanged or "winged" heat radiators, including the cooling tubes of small gas-engines. Gas engineers will also recall the "ribbed retort." Appreciation of the principle helps one to understand how obnoxious to the efficiency of a boiler-plate, or other heat-transmittor, may be a thin uniform coating of grease, hard scale, or other smooth substance, including plating.

To return to the first point, which is that of the proper treatment of the fuel in furnaces in general, and in those of water-tube boilers in particular, it should now be possible to perceive more clearly than before, that the vexed question of the fuel economy of these boilers is resolvable into the two factors of good heat transmission, and good combustion. With regard to the former, it is understood that the comparatively small tubes of a water-tube boiler are of higher efficiency than the heating surfaces of a fire-tube boiler. This appears to be an established fact. The "Engineer," in another place, puts it that "800 square feet of water-tube ought to be nearly equal to 1200 feet of fire-tube, as far, at least, as the making of steam is concerned." This should be so much to the good. With regard to the furnace, the correct proportioning of this all-important member of a steam generator is a study to which gas engineers, with their exceptional knowledge of the working of gaseous retort furnaces, should be competent to bring a high degree of initial competency.

There is a very great deal to be done with these increasingly popular steam-generators, in adapting them to burn gas coke or even breeze, with forced draught, for town use. At present, only the best and most expensive Welsh smokeless steam coal can be burnt in such boiler furnaces, when fully worked, without fear of the Smoke Prevention Acts. It might be left to mechanical engineers generally to find out how to burn inoffensively the cheaper kinds of bituminous coal in these furnaces; while gas engineers address themselves to the adaptation of coke. Of course, these furnaces will burn coke now; but the question often arises of getting more work out of the boiler than a fire of coke with ordinary chimney draught will always do. It is not for us to mention the various mechanical expedients for forcing a draught, which are the familiar resources of all modern pyrologists. Neither are we prepared to dogmatize on the choice between induced and forced draught. The use of the water ash-pan for the protection of the fire-bars, or its development, wetted bars, is feasible with this description of furnace, as it was not in the case of Lancashire boiler furnaces. The main condition of successful combustion consists in getting the first water tubes as close as possible to the hottest fire without touching it or the living flame; and then in bringing the rest of the tubes into the closest contact with the inert products of combustion. That is Mr. F. Siemens's rule, put into the fewest words; and an ever-present sense of its validity is the very beginning of wisdom in regard to this matter. Not the least advantage of the forced draught is that it enables the length of the furnace flame to be regulated at the will of the designer. The question will arise, of course, as to the degree in which a coke-fire thus controlled should be treated as a gas-generator; but this is precisely one of the features which the skilful designer will work out as he goes along. Such a furnace may well be a gas-generator under some conditions of working, and not under others.

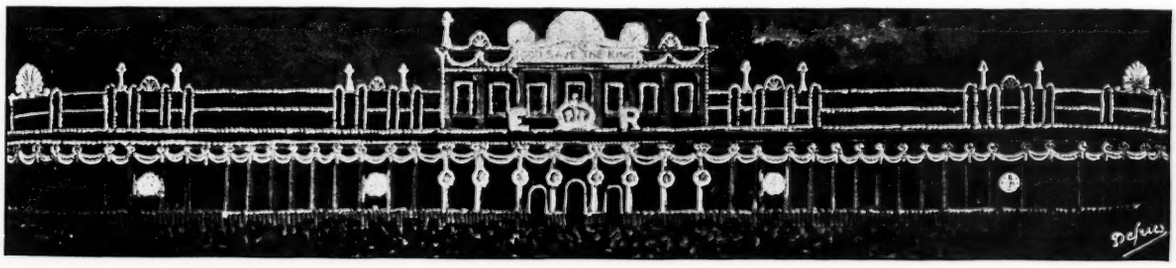
Lastly, there will be the mechanical problem of stoking. But enough has already been stated to show that the present boiler question is not a simple one, inasmuch as it invokes philosophy, physical science, and engineering skill for its satisfactory solution. Yet, lest the issue should appear too involved, let us hasten to remark that there is nothing in the problem that an adequately equipped engineer, void of prejudice, cannot hope to grasp and bend to a rational conclusion on the whole matter. It should not be an exaggerated hope that some of the best examples of the solution of the general problem with correct application to special circumstances may be found in British gas-works, or in cases where gas engineering advice has been taken by power users, and the fuel of civilization—coke—is the source of heat employed by preference,

A SURVEY OF THE CORONATION ILLUMINATIONS.

Illuminations as public manifestations of rejoicing and joy are becoming increasingly popular. This is evidenced not only by the streets of London to-day, but by the streets of the principal cities and towns throughout the country. Confining ourselves, however, for the present to London, a critical survey of the illumination arrangements for the ill-fated Coronation of the King leaves one with mixed feelings of pleasure and disappointment—pleasure born of the wealth and extent in parts of the illumination preparations and of the imposing spectacle which, it is hoped, they will contribute to the celebrations, but disappointment engendered by the little show of real novelty. It may be confessed that this is a case in which perhaps it is easy to criticize, but difficult to offer new suggestion. Successive experience, however, does not seem to have aided the specialists in improving on their previous ideas, and for the main part all that is found is merely an elaboration in extent of, and not in conception upon, former operation and work. A fashion seems to have been set from which the specialist finds it difficult to depart. Skill, it may be admitted, is shown in application and disposition; but the unhappy absence of any attempts to strike out new lines in the art of illuminative decoration impresses the observer who looks at the illumination preparations from this point of view. The art has become far too much geometrized; and we are afraid the stiffness of many of the installations will soon cloy the sightseer who has any love for artistic novelty and change. Up to now, London has not, through the country's misfortune, had a general illumination. That is a treat held in store. But there have been test trials here and there; and these, and an inspection of the general preparations, give a fair indication of what may be expected.

A large amount of the illumination is arranged for by simply following the contour and structural features of buildings with outline work and coloured glasses. The increasing number of imposing buildings in the main thoroughfares during the last few years gives greater scope even to this antiquated form of adornment; but the improvement from the spectacular standpoint is due more to the opportunity given by the architect than to the originality of the specialist in illumination. But one soon tires of stiff, undeviating lines of light, when there is nothing else to relieve them. Where this outlining is simply used as a framework for interior ornamental illumination, a very tasteful effect is produced in many cases. But here again there has been great conservatism, and a too stringent adherence to devices especially appropriate to the occasion and expressive of loyalty. People seem to forget that the very fact that they are illuminating their premises is sufficient token of their loyalty and joy, and that there is no occasion to slavishly follow a particular style of subject for the ornamentation. There are on this occasion myriads of cut-crystal and outline devices of great richness and merit; but their subjects all run in the same groove, and so give to the sightseer little variation. The Royal Coat of Arms, the imperial crown and cushion, the King's and Queen's cyphers, portraits of the King and Queen, medallions with cyphers or portraits in the centre, shields with the royal quartering in the centre, stars, and ribbon devices or medallions bearing such legends as "God Save the King" and "Long Live the King and Queen" are the favoured forms and subjects of the embellishing parts of the illuminations—all suitable for the occasion, and beautiful pieces of workmanship, but they present where there is so much illumination little pictorial and artistic change. In the City, the Corporation and some of the banking and other companies have had their own arms or those of the countries they represent worked up into devices, and these, it may be remarked without in the least being disloyal form a very pleasing variation. Speaking generally, one cannot help feeling that, shorn of drapery and floral decoration, some of the schemes of illumination look barren indeed.

Having had this little grumble at the want of diversity (referring, of course, only to the illuminations as distinct from the ordinary decorations), it must be candidly admitted that there are numerous buildings, which taken individually, are handsomely treated, and expense has not been spared. Even in the more simple gas-lamp decorations, there are to be found some examples where the designer has had an eye to getting a variation



A Night Photograph by Defries and Sons of the Gas Illuminations at the Bank of England.

in effect. Lines of lamps, for instance, are broken up by small arches or other devices; festoons of lamps with circled or other shaped ends are applied; pediments of doorways and windows are outlined with lamps and fitted with various devices; and single and double swags of lamps are carried in convenient positions, and interspersed with pateræ or other ornaments. Such changes in design are found, and are pretty contrasted with the quakerish severity of the horizontal and vertical outlining of some buildings. In these simple lamp decorations a judicious application of different coloured glasses adds to the effect. In several installations, however, there is a depressing restriction to one or two colours—amber and green are the ones most applied. But in those in which ruby, blue, and white glasses are intermingled, far prettier effects are produced. Why amber and green glasses should be so general, is difficult to understand, unless rumour says truly that they are the cheaper. Of course, where the cut crystal glass or outline lamp devices have been tastefully combined with illumination lamps, the display is greatly enriched. In the main thoroughfares transparencies do not seem to have been adopted to any great extent; but where they have been, they are as a rule framed in cut-crystal or with ordinary illumination lamps, and, so far as a daylight inspection enables one to judge, they should show up well. But in many cases these devices—crystal, outline, and transparencies—stand on huge frontages in severe loneliness, without bordering or radiating lines of lamps of any kind. Where these isolated pieces appear in close proximity to other buildings radiant with many lights, they will look miserable indeed; and the ordinary sightseer, who has any artistic feeling or a spark of pity in his or her heart will merely give them a compassionate, and not admiring, glance and pass on. In illuminating main thoroughfares, flanked by imposing business buildings, it is far better for occupiers, if they are not going to do the thing well, not to participate at all, than bring upon themselves ridicule by making a miserable show, which impresses other people with the idea that they entertain the feeling: "We suppose we must do something, but it is going to be done as cheaply as possible."

To describe particularly here all the really rich examples of illuminative decoration in London is out of the question, and yet they are but few among so many installations. The beautiful cut crystal devices selected by H.R.H. the Prince of Wales for the decoration at Marlborough House and York House are magnificent examples of that class of work—those at Marlborough House especially possessing new flights in character which make them, apart from their spectacular grandeur, objects of more than passing interest. For the illumination of the Government buildings, one form of design, it is understood, was adopted throughout. Both in magnitude and richness of colour and design these illuminations will, if completed, doubtless be very attractive; but perhaps a little less rigorous adherence to a uniform design would be an improvement. One of the best pieces of illuminative decoration in London, it can be said without fear of challenge, is that which was designed by Messrs. Defries for the Bank of England, to serve not only for illumination but for daylight decoration as well; and it may be described as a good example. The whole façade, including the windows and arches of the central front, is outlined in amber and crystal lamps; the lower course being decorated with double garlands of crystal lamps, caught up with deep ruby bows. The upper part of the central portion of the front carries a large cut-crystal panel, 34 feet long, bordered with amber, and bears the legend in deep ruby cut-crystal letters, "God Save the King and Queen." This panel is surmounted by a flowing ornament in cut-crystal, the style of which harmonizes with some of the masonry, the form being somewhat similar to that of the Grecian honeysuckle; and the cut-crystal ribs, which are raised in high relief, are defined by lines of deep-cut ruby crystals. Similar ornaments of the same order serve as terminals to the panel; and these return at right angles to the front. Large examples of the same character crown the two ends of the building, and turn round towards the Princes Street and Bartholomew Lane faces. The long line of the roof is broken at intervals by arches and other ornaments in similar style to the cut-crystal devices, but formed in crystal illumination

lamps bordered with amber, and with ten flambeaux, all of cut crystal with deep ruby mounts; the pair on the central portion being 10 feet high. Below the legend appears the imperial crown on a ruby cushion, flanked by the letters "E.R.," all in cut-crystal. Each column bears a laurelled wreath in various shades of green cut-crystal; and four large circular medallions bearing the St. George's Cross on their domed centres, surmounted by the Imperial Crown, and encircled by garlands of cut-crystal laurels complete the illumination. The illuminant throughout is gas; and the decorative effect is produced by night by the transmitted light, reflected and refracted through the millions of facets on the face of the building, and by day by the reflected light of the sun, in which the small illumination lamps on the great building, no less than the brilliant cut-crystals, give a decorative effect which it would be impossible to obtain by any other means. Nearly 30,000 gas-burners have been used in this illumination of the Bank; but the actual cost of gas will not exceed £6 an hour. This, we understand, is the most economical illumination that has been executed by Messrs. Defries; and it has enabled them to put the maximum of illumination at a minimum of cost. Had the same design been worked upon the old fashion of open gas work, it would, they say, have required nearly twenty times as much gas.

Nothing need be specially said about the electric illumination arrangements. There are many of them very pretty, and no complaint can be made on the score of lavishness in the treatment of some of the installations. The incandescent lights lend themselves to a free application in connection with natural foliage; and, from a decorative point of view, they have, in this one respect, an advantage over gas illuminations. But, as was mentioned last week, the London County Council are filled with fear as to the risk of fire from these temporary electric light installations; and Messrs. Defries, with their large experience, state that the Bank gas installation is "the most economical illumination" that has been executed by them. So that, without going further, it is safe to say that gas can show good points over its electrical competitor for outdoor illumination. In some cases combination displays of gas and electric lighting are made.

To turn to the Provinces, where in certain of the principal cities and towns, owing to the favourable character of the reports concerning the King, the illuminations arranged for the two specially created bank holidays were duly carried out, we hear of some examples of illuminative decoration which would vie with success with many of our most prominent London efforts. One notable installation may be referred to, and that is the one at the Birmingham Council Hall. There a colossal centrepiece of a highly artistic character has been fixed. The central design represents the City Arms; the figures and ornaments being in high relief. The work, in fact, has been executed throughout in crystal-relievo. Some idea of this *chef d'œuvre* of decorative art may be gathered from the fact that upwards of 30,000 crystals have been employed in its composition; every hue suitable to the design being represented. Each crystal is cut exactly on the principle of the diamond; and the number of brilliant light-reflecting facets amounts to quite two millions. When lit up, the effect is most striking. The steel framing used to secure the crystals and support the various parts of the design represents a length of nearly six miles. Perhaps the most remarkable point about it is that, owing to the extraordinary light-producing power of the facets, the consumption of gas in its illumination does not exceed 1500 cubic feet per hour. In addition to this unique piece of crystal work, the Council have provided a setting of many thousands of open gas-jets.

Beyond these notes and general impressions, we cannot go—space alone preventing an excursion in greater detail into the best of the numerous schemes of illumination. Sufficient, however, has been said to show that, in our opinion, from the point of magnitude the illuminations (in certain districts) are good, that the character of much of the work is rich and graceful, but that there is very little which tells of the exercise of the imagination in creating new features and combinations, while there is much which indicates the narrowness of the way into which the specialists have walked. We certainly miss in the streets of London—greatly to the disadvantage of many of the schemes of illumination—the best of the ornate devices of some of the leading gas-fitting makers of which we had graphical representations three or four months since.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 106.)

THE Stock Exchange reopened on Monday after the three days' Coronation interval. It was soon apparent that caution was the watchword, and the public were not inclined to come in; and all through the week there was great slackness in dealings. Prices which had been so roughly put down on the intelligence of the King's illness were cautiously raised as the bulletins from time to time encouraged hopefulness; and the final favourable announcement just before the close fairly clenched the rise. But the total improvement of the entire week did not amount to much. The Money Market was considerably easier, as it naturally would be with the opening of the new half year; and there is nothing visible on the horizon to mar the promise of cheap money to which we adverted a month ago. In the Gas Market, there was a decided revival of activity compared with the average of recent weeks, and dealings were not confined to a few heavy issues to so great an extent as they were. Changes in quotation are few and slight; but they are all in the upward direction, and are fairly indicative of a general tendency to firmness in Gas securities. In Gaslight issues, the ordinary was pretty active, and changed hands steadily at figures which did not range outside the limits of 94⅛ and 95⅛; and there was a fair amount of dealing in the secured issues at good middle figures. The debenture even advanced a point. South Metropolitan was more active, and dealings ranged from 121 to 123; but there was no sign of any disposition to improve upon these. In Commercials, there were a few dealings at middle figures, but no sign of advance. The Suburban and Provincial group exhibited their usual state of repose. Brentford new was put up a point; but locally Newcastle lost a small fraction. At a local sale, some Sheffield stock realized better than the market quotations; but the latter still stand unchanged. The Continental Companies were more interesting than of late. Imperial was more freely dealt in, and advanced a point. Both Europeans improved, and Union changed hands at top price. There was nothing to call for remark in connection with the undertakings in the remoter world. Business in the Water Companies exhibited nothing but its usual imperturbable calm, nor is it likely to recover animation before the eventful shape of the Government Bill can be seen looming in the future. However, the tendency was firm generally, while East London and Southwark had a slight advance.

The daily operations were: Gas was very quiet on the re-opening day, and quotations did not move. In Water, East London and Southwark ordinary rose 2 each. Business in Gas quickened up on Tuesday and Wednesday, and was at its most active stage on Thursday; but quotations did not vary on any one of the three days. Transactions on Friday were more limited; but prices were good. Gaslight debentures and Imperial rose 1. Saturday was quiet and firm. Brentford new gained 1, and each European issue ½.

THE GERMAN GAS AND WATER ASSOCIATION AT DUSSELDORF.

Special Report of the Proceedings.

WE are enabled to-day to give a translation of the report sent by a representative of the later portion of the proceedings at the meeting at Düsseldorf the week before last; the earlier part having been published in the "JOURNAL" for the 1st inst., p. 19.

VISIT TO THE GAS-WORKS.

On Saturday, the 28th ult., those who had attended the meeting had an opportunity of visiting the Düsseldorf municipal gas and electric works. The following particulars of the gas-works indicate the chief points of interest. About 1888-89, as the old gas-works were proving incapable of supplying the quantity of gas required to meet the demands of a rapidly growing population, the erection of new works to the east of the town was undertaken. In 1898, these were enlarged to their present productive capacity of about 4¼ million cubic feet per diem. The works, known as the "Grafenberg," comprise two sections, having a long retort-house in common, with coal-shed attached. The coke-storage yards are in front of the retort-house. The coal-shed and coke-yards are provided with standard gauge railway tracks. The retort-house contains 57 beds, with full generator settings, each of nine horizontal retorts. The beds are distributed in eight benches. Four exhausters, working in pairs separately, draw the gas from the hydraulic main through the condenser, and force it through the tar-extractor, purifiers, and station meter to the gasholders. The purifying plant in each section consists of two sets, each of four purifying vessels, which can be changed about by Gareis centre valves. The gasholder installation at present comprises two gasholders of 1,400,000 and 880,000 cubic feet capacity respectively; but there is being erected this year a third holder of 1¾ millions capacity.

The make of gas during the working year 1900-01 was nearly 630 million cubic feet, and the coal used was 60,440 metric tons. The coke made amounted to nearly 41,840 metric tons, and the tar to 2655⅓ metric tons. The gas liquor was worked up to sulphate of ammonia, of which 546·09 metric tons were produced in the year. The maximum day's output of gas was 3,085,250 cubic feet, on Jan. 5, 1901; and the minimum, 699,000 cubic feet, on June 3, 1900. There were, all told, 9438 private consumers connected with the distributing system; and of these, 5450 used gas for cooking, heating, or power purposes. The number of gas-engines in use was 331, having an aggregate of 2016·5-horse power. There were 133 engines of only 2-horse power or less. The type of place in which the engines are mostly fitted likewise points to their being used for small industrial purposes. 159 gas-engines were used by fitters, joiners, butchers, coffee roasters, bakers

turners, or cutlers. For public street lighting, there are 4463 street lamps. Two mains, each nearly 36 inches in internal diameter, lead from the gas-works to the districts supplied. The total length of the distributing mains at the end of the year was nearly 121½ miles. The price of gas for lighting purposes was 16 pfennig per cubic metre (about 4s. 6d. per 1000 cubic feet), with rebates ranging up to 3½ pfennig. The price of gas for cooking, heating, and power purposes is 8 pfennig per cubic metre (2s. 3d. per 1000 cubic feet), on which no rebate is allowed. The consumption of gas for heating and power purposes is constantly growing. In the year 1899, it stood relatively to the private consumption of illuminating gas at about 41 per cent. of the total output; whereas in the year 1900, it had exceeded it by more than 2 per cent. This is regarded as a satisfactory result, because the consumption of gas for power purposes is chiefly for gas-engines used by small business people. There is, therefore, special significance in the cheap price for industrial uses. The total capital expended on the works up to March 31, 1901, was 8,441,272 marks (about £422,000), of which 5,688,093 marks had been written off. The gross profit for the year 1900 amounted to 1,111,823 marks, which, after deductions, left a net profit balance of 426,874 marks (about £21,343 14s.).

The festivities in connection with the meeting were brought to a conclusion on the Friday evening, with a really magnificent firework display organized by the authorities of the Industrial Exhibition.

Water Supply.

Friday, the 26th ult., was devoted to the reading and discussion of papers dealing with water supply. The following is a summary of the proceedings on this day.

Privy-Councillor Dr. Intze, Professor at Aix-la-Chapelle, read his paper descriptive of "Valley Dams for the Water Supply of Towns." He first of all pointed out the immense importance of such works to municipal authorities, and warned them of the harm of unduly hasty proceedings in such matters. Lack of deep well supplies and the dearth of large quantities of water, together with the contamination of rivers by industries, had, even fifteen years ago, led to large volumes of water being collected by artificial means. Furthermore, enormously large quantities of water had been lost to the Ruhr, for instance, as well as to other river systems, by pumping; and the water level of these rivers had been greatly and very evidently affected. On the Ruhr, a Company had been formed, having a daily income of £11,000, for constructing dams in the valleys. It collected at nine works 6600 million gallons of water, and there were nine more works still to be constructed. After further general remarks on the construction of collecting reservoirs, the Professor said that he had come to the conclusion that large collecting reservoirs below an extensive collecting ground were of great advantage, not only for industrial and agricultural uses, but also for the general consumption. He then referred to the properties of the water under consideration. The properties of the water in the streams, &c., could (he said) be improved before it passed into the collecting reservoir. Bad water could be run round about the reservoir. The fears that the water might be injured while in the reservoirs had been completely dispelled by the experience gained in the last ten years. Contrariwise, the water actually improved through a process of self-purification which it underwent. The temperature near the bottom of the reservoir remained constant at 43° to 48° Fahr. In order to avoid any deterioration of the standing water in the collecting reservoir, it was necessary to remove from round about it all trees, plants, and turfy material, and to render them uninjurious. In the vicinity, woods and drainage channels for bad water were very effective. By observing these rules, surprising results would be attained in regard to the preservation of the quality of the water. The Professor was of opinion that this should never deteriorate beyond a certain point in the reservoir. Hygienically also the conditions were very good, as the bacteriological and chemical tests of Professor Kruse, of Bonn, had shown. These researches had likewise demonstrated that the bacteria died, on the water remaining standing in the reservoir for a long time. To improve the quality of the water, Professor Intze recommended, in addition to filtration plant, irrigation through meadows. If the water passed through irrigation meadows before drawing off, its properties would be considerably improved, as experience during last year had demonstrated. For instance, large new works should not have the water drawn off directly from the principal reservoir, but from the anterior reservoirs, after it had previously undergone the irrigation process.

The Professor explained his schemes by means of plans and drawings, and by reference to several new installations. The town of Solingen, in Rhenish Prussia, for instance, had obtained so much water that it would be able to use the surplus for electric power purposes. The large dam in the Ennepe Valley was supported by the Ruhr Valley Dam Company with £5000 a year, so that it might send daily into the Ruhr nearly 31 million gallons to compensate for the large quantities of water withdrawn by the Ruhr dam works. The new valley dam of Urft, near Gemünd on the Eifel, in Rhenish Prussia, would, he said, supply a large quantity of electric energy to four districts—viz., the town and outlying districts of Aix-la-Chapelle, and Düren and Schleiden. Valley dams were also used in Silesia, in the watershed of the Oder, to lessen or avoid dangerously high floods. About 19,360 million gallons of water were said to be collected by three principal and several secondary reservoirs. This was about the quantity of water which, according to calculations, was responsible for the great floods. The Professor illustrated his descriptions by means of a number of photographs.

Heer Halbertsma, a civil engineer of The Hague, read a paper on "The Tilburg Water-Works, especially the Well and Syphoning Pipes Plant." He said that in the year 1895, he was entrusted with the construction of these works, when the town of Tilburg, in North Brabant, had a population of 36,000, which, however, has since grown considerably, as Tilburg has large industrial establishments. The works were designed for an output of 11,000,000 gallons, of which 1,650,000 gallons might be applied to special purposes. As the delivery of this quantity had to take place in fifteen hours, the amount per hour was 110,000 gallons. In order to make the installation as cheaply as possible for the town, the country roads had to be used for the mains, and great difficulties arose therefrom. The water had to be drawn from underground sources, entailing grappling with most difficult strata of subsoil. The blue Tilburg sand contained a fair amount of loam, and was not very clean. This became noticeable during filtration. The settling bed, from which the water had to be drawn, consisted of heather, having an area of 9430 square feet. With a depth of 13½ inches, calculation showed that 141,700 gallons of water could be delivered; while, as already mentioned, only 110,000 gallons were required. The author then described the filtering plant more in detail, and next dealt with the pumping installation. The pumping-station was, he said, placed at the lowest, not at the highest, position of the underground water. The rising or syphoning pipe was projected so that in normal working the frictional loss corresponded to the height of the underground water. By this means, every point in the installation was equally pumped out. The alternative procedure would have resulted in nothing being pumped out of several of the wells. The air service consisted of two cast-iron pipes, which were not, however, equal, as on one side the service was laid higher. The air-pipes were connected with the vacuum chamber in the engine-house. The emptying of the syphoning-pipe, when atmospheric air was admitted, was avoided by an ingenious construction, in which a valve was employed. The reason why air was admitted, and no vacuum allowed, was explained by Heer Halbertsma, who then proceeded to describe some practical details of construction.

In the discussion which followed the reading of this paper, Herr Lindley, of Frankfort-on-the-Maine, took exception to some of the author's statements, especially to his theory of the level of underground water, and his statement about the raising or syphoning apparatus, which could be as well left filled with water as empty. Heer Halbertsma replied, defending his views.

Herr Beer, the Manager of the Municipal Water-Works of Berlin, and President of the Association, read a paper on "The Water Supply of Berlin by means of Underground Water." He referred to the former supply of Berlin with deep well water, and the conversion in the eighties of the Stralauer and Tegeler works into river or lake water-works. Further trials were continued for supplying the city with deep well water; but as the consumption was increasing at such a rate that within a moderate time 44,000 million gallons would be required per annum, considerable enlargement of the municipal water-works must be effected. The experiments made at the instance of the Imperial Government with clear water from the Tegeler lake were, in the opinion of Herr Beer, a failure. The transformation of the Berlin Water-Works, required in order to provide water for some time to come, must, he believed, start with underground water-works. The work, however, could only be carried on in winter, as in the summer the engines were required to be in operation. He proceeded to explain the unfavourable geological conditions which prevailed, and then referred to the trial pumpings, which might have given a more favourable result. Next he described the conditions on the Tegeler and Muggel lakes, and drew the conclusion that the inflow of water was so great that it mattered little whether rather more or rather less was drawn off. These trials on the quantity of underground water had settled the question of the sufficiency of the wells, as the old engines could thus be retained in partial use. The well and filtration plant were those commonly used. Herr Beer considered that the sieves should be near the works, and should be made entirely of wood. He described their construction in detail, and controverted the statements that the water would be injuriously affected by continually being in contact with the wood. In practice, he thought they worked well, as the formation of ferrous oxide was avoided. The filters had, he considered, proved very satisfactory.

Herr Wellmann, Manager of the Charlottenburg Water-Works, said that he thought filters of great length were not very favourable with gravel soil; they should at the most be 13 to 16 feet long. With regard to the removal of iron, he could not agree with Herr Beer, and was of opinion that wood in any case was dangerous for a filter, because it was not free from bacteria. Dr. H. Bunte made a few remarks on the removal of iron from water, pointing out that, for this purpose, it was essential that oxygen (air) should be supplied.

After some further discussion, the technical proceedings of the meeting came to a conclusion.

PERSONAL.

Out of about 100 applicants, Mr. ARTHUR E. BUCKLEY, assistant at the Formby Gas-Works, of which his brother, Mr. J. H. Buckley, is Manager. has been appointed Secretary and Manager of the Holmfirth Gas Company, in succession to Mr. Hubert Russell, who, as already announced, is now General Manager of the Callao Gas Company, Peru. Mr. Buckley served his articles at Formby, and was for three years Manager at Corbridge.

We are sorry to learn that Mr. WILLIAM FORD, the Manager of the Stockton-on-Tees Corporation Gas-Works, is somewhat seriously ill from complications following upon an attack of pleurisy. Mr. Ford has not been in robust health for two or three years past; and his medical advisers have ordered him away for a lengthy sea voyage, as soon as he is convalescent. Under the circumstances, the Gas Committee have decided to appoint an Assistant-Manager, who will take full control during Mr. Ford's absence. Mr. Ford has had entire management of the gas-works for nearly 34 years.

Mr. T. N. RITSON, who was last week appointed to succeed Mr. W. A. Valon as Engineer and Manager of the Ramsgate Gas and Water Works, has been Engineer, Manager, and Secretary to the Kendal Gas and Water Company since 1892. Mr. Ritson commenced his career in the gas profession as an articled pupil and assistant to Mr. J. Hepworth (who was then Engineer and Manager of the Carlisle Gas and Water Works), leaving him to become Assistant Engineer and Manager at the Jersey Gas-Works. We congratulate Mr. Ritson on having obtained the appointment at Ramsgate, and feel sure that he will be received with a warm welcome into the ranks of the South of England gas engineers.

OBITUARY.

Mr. RICHARD HANICK, Senior Magistrate of Forfar, and Convener of the Gas Commissioners of that Corporation, died at Forfar last Wednesday. He was for some years Outdoor Manager at the Rio de Janeiro Gas-Works, and he used to apply the experience he obtained there to his duties in Scotland. Needless to say it was not always applicable.

The Chatteris Gas Company have lost their largest and oldest shareholder by the death of the Chairman, Mr. JOSEPH KINSLEY, who succumbed on the 11th ult. to a paralytic stroke. Deceased (who was 72 years of age) had been associated with the Company since its formation in 1859, and was elected Chairman in 1883. The funeral took place at Chatteris on the 16th ult., the Gas Company being represented by Messrs. R. Moulton and S. J. Dobbs (Directors) and Mr. J. A. Baynham (Manager).

Weldless Steel for Gas and Water Pipes.—In the article under this heading, which appeared in last week's "JOURNAL," it was stated that the British Mannesmann Tube Company, of Landore, had laid down a special plant for the manufacture of "welded" steel tubes. The context, however, made it perfectly plain that the word used should have been "weldless."

Water-Tight Coating for Reservoir Walls.—Experiments made with this coating by a French engineer (M. Breuille) were conclusive as regards its adherence. The composition consists of one part by weight of refined bitumen and nine parts of Seyssel asphalte mastic. Then one-third the volume of very fine and dry sand is added, and the mixture applied to the masonry, which must be rough, and have hollow joints to facilitate adherence.

Hiring Out of Gas-Engines by Gas Undertakings.—In the correspondence columns of the "Journal für Gasbeleuchtung," the question was recently asked whether there were any gas-works which let gas-engines on hire, or sold them on an instalment plan, to persons in business, with a view to increasing gas consumption. To this question Herr A. Hoffman, the Manager of the Gas-Works at Kaiserslautern, replied that his works had for some years done it with satisfactory results. It was also stated in the same journal that the plan had been adopted at Mühlhausen. The following is the substance of the principal conditions of the hiring contract used at Kaiserslautern, as given by Herr Hoffmann. The rent is 4 per cent. of the value of the engine, and is payable at the end of each year; the hiring commencing from the time when the engine is installed and ready for work. The hirer has the option of purchasing the engine by giving written notice to the gas-works, and paying a deposit of one-sixth to one-fourth its value; the balance being paid in yearly instalments as arranged. Until the payment is completed, the engine is the property of the gas-works. In both the above cases, the hirer or purchaser has to pay the cost of installation and of maintaining the engine in good condition, and has also to keep it insured against fire. Should the purchase contract, for any reason, not be carried out, the gas-works has the right to retain the sum paid as deposit, and any further payments made, until its claims are settled. In the event of dispute, the amount of the claim is settled by arbitration.

NOTES.

Ammonia in Tar.

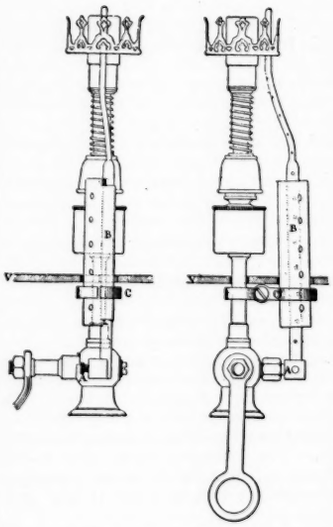
In a note presented by M. Guillet at the recent congress of the Société Technique du Gaz, some figures were given as to the quantity of ammonia retained by tar as produced in the author's works at Besançon. The ammonia was estimated by extracting the tar with acid of a known strength, and titrating the excess; and as the result of three experiments in which from 80 to 100 kilos. of tar were operated upon, the weights of ammonia per 100 kilos. were found to be 212, 554, and 286 grammes; the times of extraction in the three cases being 4, 12 and 11 days respectively. Though it is difficult to make much of such discordant figures, the plan recommended by the author for removing the ammonia may be mentioned. He arranges his cistern so that the tar on entering it flows in a helicoidal stream under water—in his case for a distance of about 20 yards. By this operation, the extraction of the ammonia is thought to be complete. The quantity of liquor thus obtained is about $8\frac{3}{4}$ gallons per ton of coal. It is employed for washing the gas.

The Cost Price of Russian Petroleum.

The important question of what is the lowest cost at which Russian petroleum can be profitably produced for the market is dealt with in the latest report, dated April, of the U. S. Consul. The total production of the Baku wells in 1901 amounted to nearly 222,000 barrels per day, a net increase of about 21,500 barrels as compared with 1900; but some 67,000 barrels were derived from the newly-drilled Government lands. The cost of sinking wells is high, averaging about £6000. On this basis, and allowing £900 a year for pumping and repairs, the owner of an average well must obtain 5 copecks per pood ($2\frac{1}{2}$d. per 36 lbs.) in order to pay his expenses. The price of crude oil fell continuously from 11·42 copecks per pood in January to 5·875 copecks in December; the average for the whole year being 8·25 copecks. This fall has continued in the present year; sales having been made at $3\frac{3}{4}$ copecks at some of the wells, and 4 copecks at others, according to quality and cost of transport. The prime cost of refined oil averages 15·51 copecks; yet it had to be sold at 11·7 copecks during last year. This year the prices realized are even lower, sales having been made into tank cars at $6\frac{1}{2}$ copecks; and it was reported that an offer to supply refined oil for the whole season of Volga navigation at 6 copecks found no takers. The price of residuum has also declined, advance contracts being taken at $7\frac{1}{2}$ copecks.

Ignition of Public Lamps.

In 1899, alterations in the public street lighting at Creusot were commenced by replacing the old batswing jets by incandescent burners. It was necessary to make this change with as little expense as possible; and, moreover, the lanterns were, and still are, in a worn-out condition. Consequently, it was advisable to touch them as little as possible. M. Goiffon, the Manager of the Public Lighting Department, then invented a system of ignition which he described at the recent meeting of the Société Technique du Gaz en France, the nature of which will be appreciated from the accompanying illustration. The burner has a three-way cock. When the handle is turned to the left, the tap is shut; when to the right, the pilot-light is on; when upright, the gas way is open. The pilot-light being ignited, by moving the handle from the right position to the vertical, the gas is turned on, the burner ignites, and the pilot-light is extinguished. The lantern is closed at the bottom by the glass V, in which are openings for the passage of the holder and the ignition-tube, which is surrounded by another tube B perforated for ventilation. By means of the small screw A, it is possible to regulate the igniting flame; and a double collar C for tightening gives rigidity to the system. The arrangement of the lantern is completed by the addition of a reflector with hood. At first, the ignition-tube differed slightly from what it is now, and had not the adjusting screw. Last year they had a lamplighter's round provided with the screw, and ignition was effected by electricity. This was an improvement, but the electrical appliances were too delicate, and worked badly



in rainy weather. At the end of 1901, M. Goiffon adopted the alcohol lamplighter's lamp, of the Paris Gas Company, and now he is quite satisfied, both as regards ease of ignition in all kinds of weather and the good results in wear of mantles.

Moncrief on the Strength of Columns.

The issue of "Engineering" for the 6th ult. contained an important article, which cannot be summarized here, by Mr. J. M. Moncrief, M.Inst.C.E., on the practical strength of columns or struts of wrought iron and mild steel. In this article the author draws attention to the results of experiments in wrought iron and mild steel, and applies them to the formulæ for calculating the strength of columns which he has already published. The article gives both divisions of information, and appears to be deserving of careful study by those who have to design columns and struts for particular purposes. Diagrams are given showing the parity between calculated and observed strengths. Some preconceptions are confirmed, and some refuted by these particulars. The author remarks upon this, that probably not one engineer in a hundred has more than a "formula" idea of the strength of a column of given section and proportions. The faith which is thus reposed in formulæ can only be excused by the absence of a condensed and comprehensive record of the experimental evidence which lies scattered through numerous published papers. Mr. Moncrief is of opinion that columns should be designed with reference to fixed values of maximum working fibre stress, and his formulæ are based on stresses up to the limit of elasticity.

The Birmingham Appointment.—Twenty applications have been received for the position of Works Engineer at the Windsor Street station of the Birmingham Corporation Gas Department; and from these a selection will be made for appearance before the Committee on an early date.

Welsbach Litigation in Australia.—Cable advices have just been received from Australia to the effect that the Australasian Incandescent Gaslight Company, Limited, have been successful in the Supreme Court of Victoria against a Mr. Brown, of Melbourne; damages being awarded, and a perpetual injunction and certificate of validity on the 1894 patent granted. As this patent is equivalent to the 1893 patent of Great Britain, the decision is stated to absolutely safeguard the monopoly of the Company in Australasia until 1908.

Methylindenes from Coal Tar.—In a recent number of the "Berichter," Herr J. Boes dealt with this subject. According to an abstract in the "Journal of the Society of Chemical Industry," the mixture of methylindenes obtained from the coal tar fraction boiling at 200° to 210° C., freed from acid and basic oils, was oxidized by boiling for some time with dilute nitric acid. On evaporation, an acid mixed with a tarry residue was obtained—the former consisting of a mixture of hemimellitic and trimellitic acids. The two tricarboxylic acids would be derived from the 4 (7) and the 5 (6) methylindenes (Moschner's nomenclature). Probably all the four methylindenes theoretically possible are present in the fraction, since their separation is not possible, owing to the slight differences between their boiling-points and the melting-points of their picrates.

Remarkable Case of Pipe Corrosion.—On the occasion of the 22nd annual meeting of the American Water-Works Association, which recently took place in Chicago, Professor Mason, of the Troy Polytechnic Institute, described a remarkable case of pipe corrosion. He showed a piece of pipe taken from a 12-inch main laid in the salt meadows of the New Jersey coast, to carry the water supply of Atlantic City. The main had been lying for about nineteen years in the deep black mud of these meadows, the action of which had been extremely severe, as it is on all steel or wrought-iron work. After fifteen or eighteen months, the pipe looked as if it had been placed in strong acid—the fibre being brought out distinctly, and it yielded easily to the knife. Its specific gravity was 2·28, compared with 7 for the original iron. Professor Mason explained that the corrosion was due to the presence of bog moss. He recommended the laying of a wooden stave pipe under such conditions.

Water Filtration through Sand and Loam.—In a communication to the "Annales de la Société Géologique de Belguique," Mr. W. Spring described some investigations on the above subject, which had led him to the following conclusions: The velocity of water circulating through sand in a horizontal direction is not inversely proportional to the thickness of the filter, or directly proportional to the pressure. In thick filter columns, the effect of the pressure gradually diminishes, and finally the movement of the water depends solely upon the imbibition. The action of very strong pressure also ceases beyond a certain distance; consequently local pressure on a sand filter is not transmitted to any considerable distance. In the case of filtration in a vertical direction, concordant results can only be obtained when the grains of sand are of uniform size, as under the influence of water moving in a vertical direction, the fine particles rise to the top, and prevent the free circulation of the water. If the water passing through the sand filter contains air, the latter adheres at certain places to the grains of sand, and hinders to a considerable extent the downflow of water. Increase of temperature heightens the efficiency of a filter.

TECHNICAL RECORD.

EXTRACTION OF CYANIDES FROM GAS.

By M. Guillet.

[A Paper Read before the Société Technique du Gaz en France.]

The following account of experiments made by treating gas containing much ammonia with solutions of ferrous sulphate carries on the interest of the researches made by Dr. Bueb in 1900 the gist of which is briefly as follows: Gas, freed from tar, on treatment with ferrous sulphate solution, is simultaneously deprived of some of its ammonia and hydrogen sulphide, which are absorbed by the metallic solution, with the formation of ferrous sulphide and ammonium sulphate. The former is at the same time attacked by the hydrocyanic acid in the gas, and is converted into hydroferrocyanic acid and hydrogen sulphide; the hydroferrocyanic acid lastly combines with the iron and the ammonia to give a double insoluble compound of the composition $Fe(CN)_6 \cdot (NH_4)_2Fe$.

In making analyses, the method of Dr. Bueb was discarded for one in which the liquor from the washers was rendered acid by sulphuric acid, and the hydrogen sulphide liberated, on boiling, collected, and estimated. The filtered solution then contains only ammonium sulphate and ferrous sulphate; the cyanogen remaining on the filter in an insoluble state. The ammonia and iron are estimated in the clear filtrate; the residue is examined for cyanogen and ammonia.

Analyses were made of the gas used in the experiments at the same time; the ammonia, sulphur, and cyanogen being estimated. Throughout the experiments, the cyanogen was weighed as crystallized potassium ferrocyanide, $K_4Fe(CN)_6 \cdot 3H_2O$; so that all figures are comparable. Note should be taken of this, otherwise certain figures appear absurd. For example, analysis of the cyanide compound will be found to contain more than 100 per cent. of yellow cyanide. As a matter of fact, the discrepancy lies in the mode of expression. The compound probably contains its cyanogen in the form of $Fe(CN)_6$, which, of course, when combined with potash, would give the excessive quantity of yellow prussiate indicated by the figures. The first experiments were made by passing different volumes of nearly the same gas through flasks, each containing 40 grammes of ferrous sulphate in 40 per cent. solution. The results were as follows:—

—	B.	D.	E.
Gas passed in excess of that required to approximately saturate (litres)	6670	8870	7130
Total ammonia passed (grammes)	22·01	31·93	20·10
,, ,, retained (do.)	14·14	13·95	14·53
Yellow cyanide retained (do.)	18·52	19·51	20·86

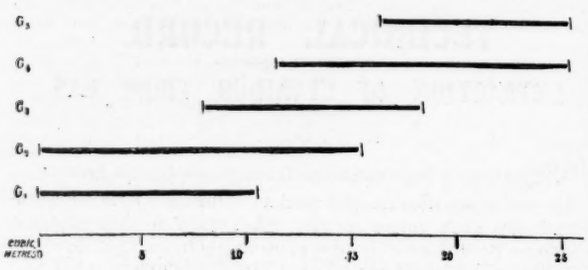
It will thus be seen that, however much ammonia is passed on, the amount retained is practically constant, as is also that of the yellow cyanide. The solution of ferrous sulphate, when treated thus thoroughly, tends to the composition of the liquor from a washer working under similar conditions. Apparently also there is a ratio between the ammonia retained and the yellow cyanide formed. In the three instances quoted above, it is 0·76, 0·71, and 0·69. For a less degree of saturation, the ratio is more—1·84. Its lower limit seeming to be about 0·60.

The presence of ammonia in sufficient quantity is necessary for the proper absorption of the cyanogen, as is seen from the action of gas on a series of five flasks containing 40 per cent. of ferrous sulphate solution. The figures likewise show the connection between the proportion of ammonia, that of sulphur, and the temperature of the surrounding air. The flasks were placed so that some were traversed in series by the gas as represented in the diagram (p. 90), which shows the points where the flasks were placed in, and removed from, the current of gas; the volume of which was 24,130 litres, and occupied six days in passing.

—	NH_3.	S.	CN.	Temp.
				Deg. C.
May 6 morning	2·35	6·02	3·56	9·0
evening	2·54	4·65	4·07	11·0
,, 7 morning	1·82	6·24	4·58	6·5
evening	2·25	5·07	4·68	8·0
,, 8 morning	1·57	5·28	4·49	2·0
evening	2·37	5·89	4·06	9·5
,, 9 morning	1·88	5·35	4·00	6·5
evening	1·87	5·82	4·70	8·0
,, 10 morning	1·98	5·79	3·82	12·0
evening	2·13	6·16	5·05	11·0
,, 11 morning	2·01	5·81	4·18	10·0
evening	2·56	5·75	3·44	13·0
Means	2·11	5·65	4·22	..

If the temperatures, sulphur, and ammonia be plotted out as curves, it will be found that the first and last are naturally connected; while the sulphur varies inversely with the ammonia.

To return to the cyanides, however. At the end of the time, the



contents of the flasks were analyzed by the method already outlined, and the results were as follows :—

—	G_1.	G_2.	G_3.	G_4.	G_5.	Total.
Total S passed through the flasks	..	..	..	..	..	136 33
S retained	0·432	1·276	2·38	1·24	3·36	8·68
Total NH_3 through the flasks	..	..	..	..	..	50·91
NH_3 in the filtrate	11·24	10·78	85·20	9·56	6·74	46·84
NH_3 in the cyanide	1·40	1·52	0·86	1·19	0·35	5·32
Total	12·64	12·30	9·38	10·75	7·09	52·16
NH_3 in filtrate, as $(NH_4)_2SO_4$	43·63	41·84	33·07	37·11	26·16	..
$FeSO_4$ 7H2O used	40·0	40·0	40·0	40·0	40·0	..
Do. recovered in filtrate	4·17	2·85	14·39	6·11	25·36	..
Cyanide material (dry)	48·65	19·47	12·68	16·31	6·00	..
Yellow cyanide passed through the flasks (from gas analysis)	..	..	..	..	..	101·82
Yellow cyanide retained	17·47	19·00	10·82	14·85	4·48	66·62
Ratio of NH_3 to yellow cyanide retained	0·72	0·64	0·86	0·72	1·58	0·78

It was evident that the proportion of ammonia was insufficient during the time of the passage of the gas. There were never more than three flasks in series; yet the third never became brown from ferrous sulphide, though the gas passing through it contained plenty of hydrogen sulphide. The ammonia was completely absorbed by the first flasks.

The figures for the cyanides show that G and G_2 are completely saturated, and present no special interest; but G_3 suffers from deficiency of ammonia (owing to a fall of temperature) and allows a notable proportion of cyanide to pass. The case of G_4 is similar; and the result in the "total" column is a deficit of 20 per cent. in the cyanide absorbed compared with that in the gas.

The ratio of ammonia absorbed to yellow cyanide formed has been previously placed at about 0·7 gramme. Now, from the the figures of G —G_5, we see that the mean figure for ammonia was 2·11 grammes per cubic metre. If the ratio of 0·7 is equally correct in the case where there is insufficient ammonia, the yellow cyanide should have been 3·01 grammes per cubic metre, or 72·63 grammes for the total volume of 24,130 litres. Analysis gives 66·62 as the actual yield of yellow cyanide, from which we get the ratio of 0·7, confirming the previous computation.

In studying the effect of the strength of the iron solution on the reaction, it was found that 40 per cent. is a practical maximum from the point of view of obstruction in the pipes, &c., and that a 20 per cent. solution acts precisely the same as one of double the strength, save that the weaker solution retains more ammonia. The weight of insoluble cyanide employed is about half that of the iron sulphate. The cyanide precipitate obtained by boiling the acid liquor varies in composition, and does not appear to be a true chemical compound, but would seem to contain more yellow cyanide and ammonia the more complete the saturation. The following figures give the composition of the precipitate obtained in 20 per cent. ferrous sulphate solution :—

Cyanide Precipitate. Grammes.		Yellow Cyanide. Per Cent.		Ammonia. Per Cent.
10·02	..	94·5	..	7·59
9.48	..	98·1	..	7·82
10·05	..	95·8	..	7·63

The double insoluble cyanide of iron and ammonia has the formula $Fe(CN)_6 \cdot (NH_4)_2Fe$, corresponding to yellow cyanide, 138·9 per cent.; ammonia, 11·17 per cent. It is this body to which the precipitate corresponds most closely.

Practical Conclusions.

Other things being equal, a certain quantity of ammonia must be present, the proportion being 0·7 of the yellow cyanide (or the cyanogen calculated thus). Hence cyanide extraction reduces the ammonia in the gas; while a gas too highly freed from ammonia will occasion the loss of cyanides. The cyanide content of the gas is practically constant. The gas entering the cyanide washer seems to have its proper proportion of ammonia. On its exit from the washer, both ammonia and cyanides will be found to be completely absent. If excessive ammonia is present, the most economical plan is to reduce it to the proper degree before the gas goes to the cyanide washer. In an eight-compartment "Standard" washer, the first three may be used for washing the gas in water, or, better still, in weak ammonia, and the remaining five employed for the cyanide extraction. As a guide to the proper condition of the gas, a piece of turmeric paper, strongly acidified with tartaric acid, is recommended. It does not become blue unless a considerable proportion of ammonia is present; and it is changed about every two hours. English coals give about 7·5 to 8 grammes of yellow cyanide per cubic metre, and this requires about 5·2 to 5·6 grammes of ammonia per cubic metre of the gas; and as the gas passing into the cyanide washer should contain 2·54 grammes of ammonia per cubic metre, only about half the ammonia is to be removed by the first washer.

Coming now to the treatment of the liquor from the cyanide washer, we could obtain the insoluble cyanide precipitate by the same process as that used in the analytical method already given —viz., treatment with excess of acid; but as this would give a sulphate of ammonia containing iron sulphide (though not enough to appreciably colour it, or lessen its market value), the following plan is less open to criticism. The action is arrested exactly at the point when the cyanide is all in the insoluble state, and pure sulphate of ammonia only remains in solution. This stage can be easily recognized by the workman in charge of the plant. To the crude liquor, dilute sulphuric acid is added, and the hydrogen sulphide allowed to escape. After agitation, a drop of the liquor is brought on to a piece of filter-paper, on which it spreads into a clear yellow disc. By means of dropping-bottles, containing the respective solutions, a drop of ferric chloride and potassium ferrocyanide is brought on either side of the disc. A blue colour with the ferric chloride indicates the presence of cyanide in the liquor, and further acid is to be added. Absence of colour with the ferric chloride and a blue or green colour with the ferrocyanide indicates iron in solution—*i.e.*, the addition of too much acid. In this case, further liquor is added, and the acid run in tentatively as before. At the right point no colour is given on either side of the test drop.

If the liquor has been subjected to a large excess of gas containing ammonia, it may happen that the iron sulphide is attacked, and there is not sufficient left in the liquor to ensure the formation of insoluble double cyanide. This state of things is recognized from the orange colour of the liquor, which is turned blue by the ferric chloride. The remedy for this deficiency of iron is to add the ferrous sulphate solution used in the washer instead of acid, and to continue the tests on filter-paper as before. The results are the complete extraction of the cyanogen and the production of a very white sulphate. Very little modification of existing apparatus is required, and the management of the process does not seem to be beyond the skill of the average workman.

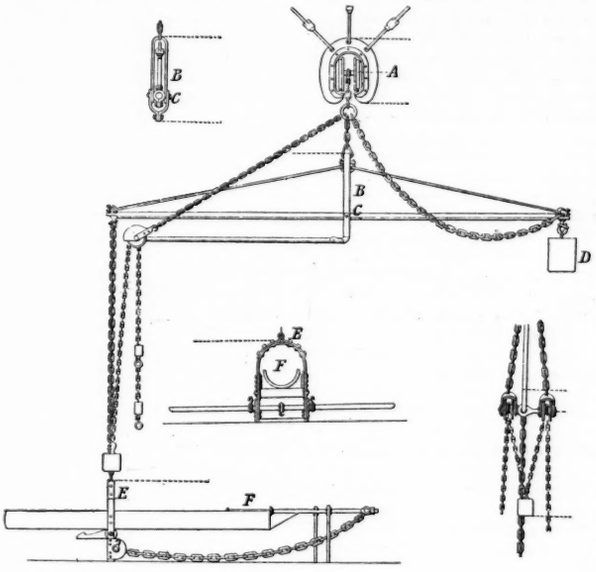
In an appendix to his paper, the author suggests the following simplified plan for the estimation of the ammonia in the gas: In a flask, provided with inlet and outlet tubes, 10 cubic centimetres of standard acid (10 milligrammes of ammonia) is placed, and the gas allowed to pass until the red colour of the methyl orange, with which the liquid is tinted, gives place to yellow. The gas is measured; and on dividing 10 (the figure representing the contents of the flask in ammonia) by the number of litres, the ammonia in milligrammes per litre is obtained. If it is suspected that more gas than is required to saturate the acid has been allowed to pass, a drop or two of standard acid is added to the liquid, when the red colour should immediately return if all has been correct.

A BALANCED RETORT-CHARGING MACHINE.

In the course of the article on the papers presented at the recent meeting of the Société Technique du Gaz en France which appeared in the "JOURNAL" on the 24th ult., reference was made to one by M. Dulac, describing a balanced retort-charging machine. It was remarked that, as the appliance required three men to work it, it was not likely to supersede other systems of charging now in use in small works; but it may nevertheless be of interest to indicate the nature of the machine, the special merit of which, according to the author, is that it carries the entire charge for a retort, and requires much less labour on the part of the stokers than is necessitated by ordinary scoop charging.

The machine, as will be seen by the illustration (p. 91), consists of a carrier A, moving upon an overhead railway running parallel with the retort-benches, and supporting, by means of a chain, a fork B, having at its lower part a horizontal axis C, round which turns a balance-beam of sufficient length to reach the front of the bench. This beam, which may be moved in any desired direction, has at one end a counterpoise D; while the other supports the scoop-carrier E and scoop F. The scoop, which is of the kind described by M. Laurain at the congress of the Society in 1897, will hold the entire charge of 3 cwt. The

axis C also supports a lever, the free end of which is held up by two chains passing right and left of the beam, and fixed at the upper part by the principal chain. Another chain, running from the carrier to the end of the beam to which the counterpoise is attached, prevents the fall of the latter in the event of an accidental slip. This counterpoise balances the scoop and its carrier, weighing about 2¾ cwt., and the charge of coal; making altogether rather over 3½ cwt. The small counterpoise above E weighs 88 lbs., and when the chains supporting it are hooked to the bar shown in the small diagram in the centre of the illustration, the scoop is lightened to this extent. When, however, they are unhooked, this weight loads the scoop-carriers with 88 lbs.



When the scoop is full, the stokers hook on the chains, with the following result: On one side there is the weight of the larger counterpoise, 3½ cwt.; and on the other, the weight of the scoop, the carrier, and the charge of coal, *minus* the weight of the smaller counterpoise—say a total of 5 cwt., of which 3½ cwt. is taken off by the weight D; leaving 1½ cwt. to be borne by the stokers. An ordinary scoop weighs 1 cwt. when empty; adding half-a-charge (1½ cwt.), the stokers have to lift 2½ cwt. twice. So that with the machine less effort is required to make the complete charge. On withdrawing the scoop, its weight has not to be sustained by the men, as is usually the case, owing to the system of balancing, which is the chief feature of the machine. The upper retorts, however, call for a certain amount of effort on the part of the stokers when in the act of charging, so as to get the scoop well into the retort. But after less than a week's practice they found they gained a few minutes on the time previously occupied in the work; and, moreover, they did not show that aversion to the machine which workmen generally display towards a new tool.

COST OF POWER FOR WORKING TRAMWAYS.

At the Twelfth Congress of the Tramways and Light Railways Association and the International Tramways Union, held in the Berners Hall at the Agricultural Hall, last week, M. CHARLES THONET, Engineer and Manager of the General Contract Company of Liége, submitted a report on central stations and the cost of electrical energy. He had been asked to give technical information concerning the maintenance, consumption, and efficiency of boilers, steam and gas engines, and dynamos, and the cost of energy furnished by steam, producer gas, and hydraulic power. The following are extracts from the report.

Commencing with steam, M. Thonet says the coal used varies according to the countries; and, in general, it is selected of good quality. In Belgium, it contains from 9 to 12 per cent. of cinders. and possesses from 7000 to 7500 calories; in France, from 8 to 10 per cent. of cinders; in Italy, from 3 to 5 per cent. of cinders and from 7700 to 8000 calories. The steam production per kilogramme of coal varies from 3 to 4 kilos. for lignite, from 6 to 8 kilos. for anthracite, and from 8 to 12 kilos. for coal of good quality. The piping is generally covered with a heat-retaining coat or envelope. As a rule, the engines employed are compound tandem. When they are above 1000-horse power, they are usually cross compound, in order to bring the dynamo between both cylinders. In some stations, for very high-power units, triple-expansion engines are employed—notably in Paris and Berlin. Laval steam turbines are also operated in Paris, Holland, and Germany; but the author was unable to give any information concerning them. The engines are condensing; the condensers being of the jet type, allowing of a vacuum of 65 to 70 centimetres. The speed ranges from 52 to 150 and even 235 revolutions per minute, with the Mackintosh, Willans, and other engines. The steam pressure lies between 7·5 and 10 kilos. per square centimetre (107 to 142 lbs. per square inch). The daily cost of maintenance per car-kilometre for the steam-engines, including the salaries of the driving staff, ranges from 0·4 c. to 0·8 c. —an average of 0·6 c. or 0·5 pfennig. The efficiency of steam-engines varies from 80 to 90 per cent.—say 85 per cent.—on an average.

Passing on to deal with gas-engines, M. Thonet had to rely solely on information he possessed in connection with the working of the plant put up by his own Company. Producer gas installations are in operation at Lausanne, Zurich, Orleans, Poitiers, Rheims, Cassel, Barcelona, and elsewhere. The gas-engines put up at the Barcelona central station are of the Crossley four-cycle type, and are operated by producer or mixed gases. There are at present two 165 and one 300 horse power engines; their speed being 180 revolutions per minute. The fuel employed is anthracite, possessing 8000 calories, and from 3 to 5 per cent. of cinders as a maximum. The price is generally about the same as that of ordinary Cardiff coal, though now it has risen to 10 or 15 per cent. above. The mixed gas has a calorific power ranging from 1200 to 1300 calories. The cooling of the gas on leaving the producer is effected by means of a series of vertical tubes; and the warming of the air-blast necessary for the furnace is done at the same time. In order to purify it, the gas is first sent through a coke tower, furnished with a water-spray, and then through purifiers filled with sawdust and oxide of iron.

M. Thonet says the maintenance expenses of gas-engines are not higher than those for steam-engines, excepting in respect of the lubrication, which requires great care and the use of materials of good quality. On the other hand, fewer men are necessary for handling the producers than for working steam boilers, and an ordinary helper is sufficient instead of experienced stokers. In Lausanne, Barcelona, &c., the maintenance cost for the gas-engines and producers is, on an average, 0·25c. to 0·6c. per kilowatt-hour; they can be estimated at 0·5c. per kilowatt-hour. The coal consumptions in 1902, under ordinary working conditions, were as follows: Per effective horse-power, 0·625 kilo.; per car-kilometre, 0·9 kilo.; per kilowatt-hour, 1 kilo. The price of coal in 1900 was 47 frs. per metric ton; at present it is 36 frs. (M. Thonet points out that the tramway line is throughout on an incline, and that in 1901 the consumption per car-kilometre reached 900 watts.) At the present time, the average consumption of screened anthracite is 850 grammes per kilowatt-hour, or 750 grammes per car-kilometre; the number of watts per car-kilometre having been reduced to 750 grammes on an average. The total cost for the production of one kilowatt-hour, with coal worth 47 frs. per ton, in Barcelona is 10c.; with coal worth 36 frs., 8c.; with coal worth 23 frs., 6c.

M. Thonet closes this part of his report with the following quotation from an article on "The Efficiency of Steam and Gas-Engines," published early this year by M. Witz, of Lille:

> The thermic efficiency of the gas producer is slightly superior to that of the boiler; the efficiency of the gas-engine being much higher than that of the steam-engine. The coal consumption per indicated horse-power-hour, even for the smallest plants equipped with gas producers and engines, is far from being as high as that reached by the largest steam plants using steam superheaters. If it be understood that for thermic machines the duty of which is to perform work by the transformation of heat, the most rational basis of comparison, and the most reliable, is that which is derived from the comparison of the respective ratios of transformation of the calories in kilogrammetres, we must acknowledge that the steam apparatus are inferior to those operated by gas.

The second subject dealt with by M. Thonet related to the cost of electrical energy generated for the purpose of tramway traction by steam, producer gas, and hydraulic power. The station at Nuremberg, cost 597 frs. per available kilowatt; at Liége, for a small but very complete plant, it cost 875 frs. per kilowatt; and at Hanover, 845 frs. In Brussels, where the power of the central station aggregates 1450 kilowatts, divided between six units, the total cost of erection was 965 frs. per kilowatt. The author remarks that though this figure is higher than the others, it really represents the mean cost of such installations. When considering a central station of average power, the cost of erection per available kilowatt must be estimated at 1000 frs. For larger stations, the advantage resulting from location outside the towns, and the installation of greater units, allows the cost to be reduced to 700 frs. The gas power station for the Barcelona and San Andrès Tramway cost altogether 1525 frs. per available kilowatt. It was erected, however, two years ago, when materials were most expensive. An installation of gas plant now would not come to more than 700 frs. or 800 frs. per kilowatt. The author has lately had occasion to study an installation for a tramway line 9 kilometres (about 5½ miles) long, and he gives the following as the prices of the steam and gas plant: Two gas-engines, each of 250-horse power, or 185 kilowatts, with gas producers, purifiers, dynamos, and water-mains, 225,000 frs., or 608 frs. per available kilowatt; steam-engines, 165,000 frs., or 445 frs. per kilowatt. The laying of the water-mains was very expensive, on account of the distance from the station to the canal. Where power is to be derived from water, the prime cost is quite 1000 frs. per kilowatt, and under certain conditions it may be even thrice as much.

ENRICHMENT OF GAS BY BENZOL.

By A. Lecomte, of Paris.

[A Paper read before the Société Technique du Gaz en France.]

My paper of last year dealt with the rules of enrichment of coal gas by benzol, and concluded with a review of the apparatus employed for the purpose. In the following communication, I describe two installations, making 500 and 2500 cubic metres (17,600 and 88,300 cubic feet) per day respectively, with which a number of tests have been made. In the first of these (fig. 1), at the gas-works at Andresy-Fin-d'Oise, the gas is separated into two streams by a "divider" A, fitted with a regulator R at its inlet-valve F. A lead tube p^1p^2 takes 24-25ths, and a second tube $d_1d_2d_3d_4$ 1-25th of the total gas. The divider consists essentially of a rigid rod carrying two discs; dp measures the main stream of gas, and dd the smaller current. These two discs rise and fall at the centre of two cones, of which the angle is such that the sectional area of passage between the discs always remains the same. The free space in dd is always 1-24th, that in dp 1-25th of the entire area. The arrangement is balanced by a float; and bells working in oil-baths serve to separate the main from the smaller stream of gas. A tuyere at the side equalizes the pressure of the gas; and the mounting of the rod between rollers renders the whole very mobile.

The action of the apparatus is easily seen. The gas coming from p_1 raises the disc dp, in order to pass between it and the cone; and the annular space between the disc and the cone will be such that the speed of the passing gas corresponds to the pressure of the water, resulting from the weight of the disc. If the disc dp has a surface of 125 square centimetres, and it is desired to reduce the pressure by 3 millimetres (0·12 inch), all that is needed is to place on the upper part of the divider a weight of 37·5 grammes, and the position of the disc dp in the cone will always be such that the gas passes at a speed corresponding to the pressure thus diminished by 3 mm. But the small disc dd will have its position in the upper cone such that the surface exposed to the gas represents 1-24th of the annular surface opened by the large disc—*i.e.*, 1-25th of the total; and if the gas arrives in d_3 with a pressure (say) 3 mm. greater than that in d_4 or in the exit-pipe, the gas having the same speed as that which passes through the large disc, the volumes of the main and secondary gases will be proportional to the sections of the discs. Hence the quantity of gas passing the meter C will be 1-25th of the whole, from which the total volume of the gas is ascertained. The regulator B should have its bell equipoised; any difference of pressure produced by the immersed bell affecting the accuracy of the readings. I will consider later the results obtained with the apparatus.

The bell divider above described is a simple, workmanlike apparatus, very suitable for small makes of gas. The only objection to it is that the co-efficient of contraction of the gaseous stream varies with the position of the disc; producing an error which, in the case of large makes, may rise to an important amount. The Société des Huiles Minérales de Colombes has contrived a divider free from this defect. The one I describe here is for a make of 2500 cubic metres per day of 24 hours, and has been in constant use for eight months past in the works at Beaune (Côte d'Or). The details of the apparatus, which, in the main, are similar to those already described, are shown in fig. 2; the lettering being the same as in fig. 1. The only difference is in the divider, which consists of a cylindrical perforated bell, with syphon compensator. The gas is divided, so that the meter C registers 1-75th of the total. The bell is divided into two compartments—a large one p_1 for the passage of the gas going to the regulator, and a smaller one d_4 for the gas coming from d_3, which latter passes 1-75th of the total. The bell is balanced with such a weight as will cause the gas to emerge from the perforations at a pressure 3 mm. less than normal. The gas from d_4 actuates the meter and passes through the differential regulator B,

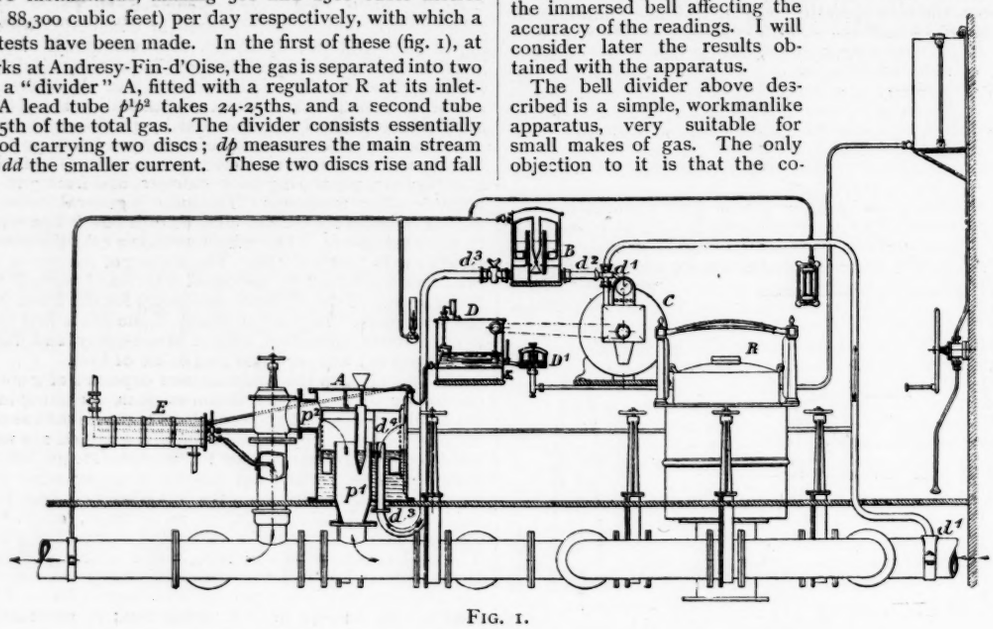


Fig. 1.

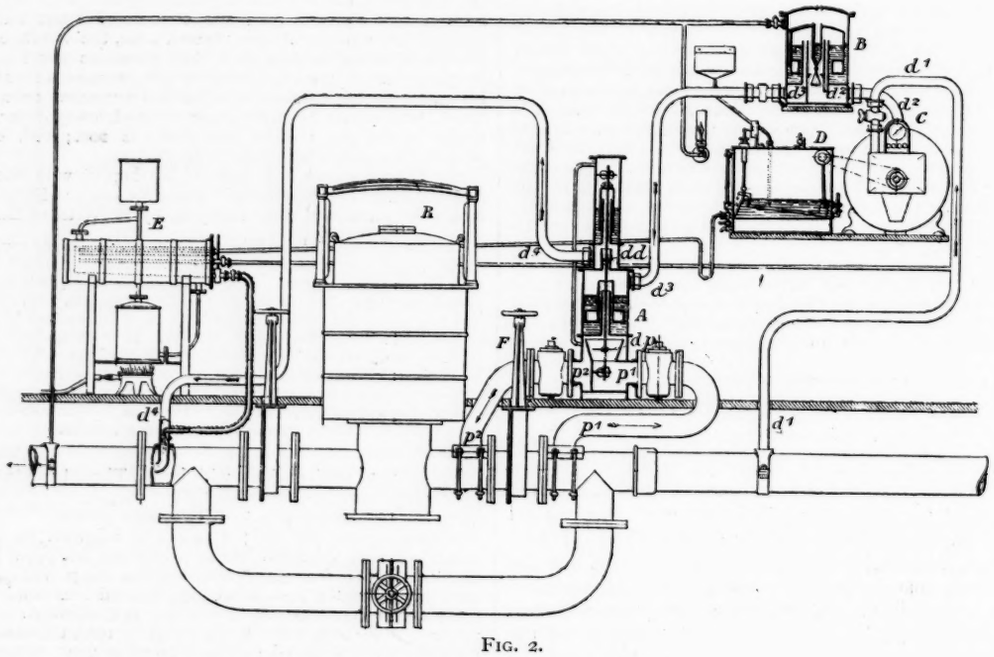


Fig. 2.

which is adjusted to deliver the gas at d_3 with a pressure 3 mm. greater than that existing above the bell in p_2. As the gas traverses the two compartments at the same speed, the ratio of the volumes is that of the total areas of the perforations in the respective compartments; and as each perforation is always working under the same conditions, the co-efficient of contraction of the gaseous current remains constant. A layer of heavy oil is used on the water in the apparatus, to prevent evaporation. D is the benzol distributor, fed by a constant-level regulator D^1; and E is the vaporizer, which is heated to 100° C. by exhaust steam. The meter shows the total quantity of gas passed per minute, and a further accessory records the number of grammes of benzol per cubic metre of gas. The weight of benzol can thus be increased or diminished as indicated beforehand by photometric tests.

The experiments made with these two pieces of apparatus by the writer, in conjunction with MM. Meugnot and Desvignes, and MM. Delcourt and Chemardin, gave these general results:—

1.—The effect of carburetting does not appear until 15 minutes after starting the apparatus.
2.—Five months' working in winter shows that naphthalene is almost completely kept down with 3 to 5 grammes of benzol per cubic metre.
3.—No action of the benzol on india-rubber joints could be traced.
4.—As much as 30 grammes of 90 per cent. benzol per cubic metre can be taken up without any abnormal behaviour of the ordinary or incandescent burners being noticed.
5.—The apparatus requires from 10 to 12 mm. (4-10ths to 5-10ths) pressure.
6.—The output of gas can vary 40 per cent. without any alteration in its illuminating power; benzol proportional to the volume passing being, of course, introduced.

In conclusion, I may record, in tabular form, some comparative photometric results (in litres) obtained with the Dumas and Regnault photometer and with the Giroud apparatus:—

Giroud.	Dumas and Regnault.	Giroud.	Dumas and Regnault.	Giroud.	Dumas and Regnault.
97 ..	96·0	103 ..	103·6	109 ..	112·6
98 ..	97·0	104 ..	105·0	110 ..	114·4
99 ..	98·4	105 ..	106·4	111 ..	116·6
100 ..	99 7	106 ..	107·8	112 ..	119·2
101 ..	101·0	107 ..	109·3	113 ..	123 6
102 ..	102·4	108 ..	110·8		

As a general rule, the Giroud apparatus gives higher readings than the Dumas and Regnault below 100, after which its readings are lower than the latter. It should be mentioned also that the carburettor of the Société des Huiles Minérales de Colombes is very suitable for the enrichment of a mixture of oil gas and water gas. A mixture containing 25 per cent. of water gas will not yield, on the average, more than 20 grammes (300 grains) of benzol per cubic metre (35·3 cubic feet).

Tarring Pipes to Prevent Rust.—Instead of applying the gas tar hot to iron pipes, as is generally done, the following method has been successfully employed, according to the "Rivista Scientifico Industriale:" The pipes are first tarred, and then sawdust or wood shavings put inside and fired. Care must be taken that the heat is not too great, or the operation continued too long.

Lime Wash for Stones.—Of all the more or less complicated washes invented for coating masonry with a protective facing, none is so much employed as lime. Its only defect is that it chips rather rapidly under the influence of the weather, and consequently does not last long enough. The following is a simple formula given by the "Annales du Syndicat des Entrepreneurs des Travaux Publics," which was prepared with a view to remedy these inconveniences: Slake 20 litres, or about 4½ gallons, of quicklime in a suitable vessel with a sufficient quantity of hot water to make milk of lime. This is diluted, and 1 kilogramme (2·2 lbs.) of sulphate of zinc is added, and then half as much kitchen salt. It is the latter which prevents the wash from cracking while drying. The mixture can be coloured by adding ochre or lamp-black in suitable quantity.

Sterilization of Milk by Gas.—In a short communication to the Société Technique du Gaz en France, M. Daudy, of Angers, described an appliance he had constructed for sterilizing milk by means of gas. It consists of a square double-jacketed vessel heated by blue gas-flames furnished by two 1-inch iron pipes, placed at a slight inclination from the horizontal. The burnt gases are drawn through the heater by a chimney, into which, should there be an accidental extinction of a jet, the gas would pass. The height of the heater is only 34 inches, and yet it will sterilize 10½ gallons of milk in an hour, with a consumption of 105 cubic feet of gas, which is supplied at a pressure of 20-10ths. The heating up of the vessel and the milk proceeds at almost the same rate. But after the gas is shut off, the milk cools at the rate of 1° C. (1·8° Fahr.) in ten minutes; so that sterilization may go on for some hours longer, if desired. About two gallons of water are required for the operation; but the author advises that three times this quantity should be kept in the vessel.

REGISTER OF PATENTS.

Incandescent Gas-Lamps.—Saubermann, S., of Vienna. No. 9551; May 8, 1901.

With the object of producing a "superior compound or amalgamation of suitable materials or substances for mantles of incandescent gas-lamps, in order to increase the illuminating properties and power of the latter," the patentee proposes to amalgamate asbestos and cotton and (or) other suitable substances in their fibrous condition, together with oxides or earths having high illuminating qualities. The fibrous asbestos and cotton are each put through a separate "opening" process to divide them, and then mixed together in the proportion of 10 to 15 per cent. in weight of the latter to the former, and woven into mantles in the usual way. Although (it is remarked) the asbestos when in the mantles is hard, it is also porous and absorbent; and when heated to a high temperature in calcining, it becomes softer and more flexible or pliable, and has exceptional catalytical qualities or characteristics, and high illuminating power. If asbestos sufficiently long in the staple to be spun into fine threads without knots or other protuberances projecting from it can be obtained, cotton and other fibrous substances may be dispensed with, and asbestos used alone.

The mantles are impregnated (in any well-known manner) with solutions of salts of the earths or oxides usually employed for the purpose, or salts of calcium containing, in addition to the less important ingredients, 0·3 to 1 per cent. of cerium nitrate, after which they are completely deprived of moisture, and subsequently calcined in the customary manner, and prepared ready for use in the lamp.

An exceedingly good illuminating effect or result is said to be attained by a combination of 98 to 99·5 per cent. of the salts of thorium oxide, and 0·5 to 2 per cent. cerium oxide, or the same proportions of calcium oxide and cerium oxide, although "all other light-generating earths or materials may be employed successfully with the asbestos and other fibrous substances alluded to."

In addition to the salts of calcium or cerium nitrate, zirconium or thorium oxide may be added; and the incandescence of the mantles will be increased by dipping them when complete or finished in a solution containing 5 to 10 parts of thorium nitrate with cerium and 90 to 95 parts of water, and then drying and calcining them.

Producing and Utilizing Gas.—Westinghouse, G., of Pittsburg, U.S.A. No. 10,013; May 14, 1901.

This invention relates to "apparatus for the production and utilization of gas" for use in connection with gas-engines and like apparatus, and in quantities required to meet the varying demands. An important feature of the invention consists in the utilization of the sensible heat of the products of combustion from a gas-engine supplied with gas from a producer, so as to return to the same producer or a similar one a large portion of the so-called waste heat at a high temperature.

The producer consists of a chamber surrounded by air-heating circuits traversed by circuits through which the products of combustion from a gas engine or like apparatus are passed. By this means, the air receives heat on its way to the fuel-bed of the producer; and the products of combustion of the engine finally escape at a comparatively low temperature. The invention embraces various improvements in the construction of the producer for carrying out this arrangement; and, in particular, it includes a construction whereby the water which is supplied to the producer shall abstract heat from the products of combustion of the engine, and also from the produced gas, whereby a further saving is effected. This water may be supplied from the water-jacket of the engine; and the heat of the cooling water is thereby utilized.

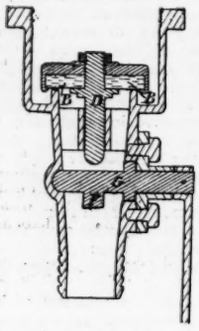
Gas-Engines.—Melhuish, A. G., of Edmonton. No. 10,895; May 25, 1901.

The object of this invention is to construct a duplex gas-engine in such a manner that two ignitions and explosions shall take place at each revolution; the products of combustion of each cylinder being alternately sucked out and transferred to the back of the other piston, to be ejected on the return stroke.

The two or more cylinders are closed at both ends, and each cylinder is connected by passages or ports; valved outlet-ports being also arranged for each cylinder, as well as the usual inlet-ports. The pistons work alternately or successively one after the other. Supposing only two cylinders are used, one piston will be at the out-stroke while the other is at the in-stroke. A single port or passage connects the two cylinders, and is so placed that the pistons in their movement alternately open communication with the top side of one piston to the underside of the other piston. For instance, on the charge being fired, the piston then working will be moved outwards and the other piston inwards; and when the working piston has completed its out-stroke, it will have uncovered the port communicating with the other cylinder, the piston of which latter will have completed its in-stroke—thus leaving free communication between the two cylinders above and below the pistons. One piston in its travel will have caused a partial vacuum behind it; so that, when the port is opened, the vacuum will create a suction from the other cylinder, and suck the greater part of the products of combustion into the space. At the same time as this is occurring, the inlet-valve automatically opens, and the fresh charge of gas and air enters the cylinder—this assisting, by its pressure, in forcing out the remaining products of combustion. By the time the greater part, or all, of the products of combustion has been sucked from the top of the working piston to the underside of the other, the then working piston will have commenced its return journey, so as to close the port and compress the charge, and form a vacuum or partial vacuum in the opposite end of the cylinder, and at its complete in-stroke to open communication with the adjoining cylinder above the piston, in order to suck the products of combustion therefrom—the then working

piston expelling the previously sucked-in products of combustion through a non-return valve to the atmosphere. The same working is performed in each cylinder.

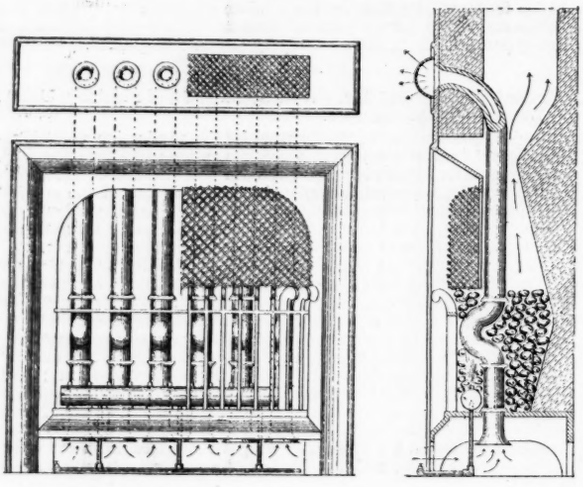
Self-Closing Water-Valve for Gas-Works Purposes.—Braidwood, J. F., of the South Metropolitan Gas Company, Greenwich. No. 11,066; May 29, 1901.



Under the above title, the patentee specifies his invention as consisting of a brass or gun-metal case, inside which is a rubber or composition valve (in a horizontal position) enclosed in a brass box or cap, with a spindle D projecting downwards, working in a hole in a cross-bar arranged for the purpose. Below this spindle, and at right angles with it, is a spindle G with a cam F on it; and this is actuated by a lever. The action of the valve is that, when the lever is turned in a given direction, the cam pushes the valve off the seat; but when turned in the opposite direction, the pressure or head of water pushes the valve on its seat again, thus automatically closing it.

Gas Heating-Stoves.—Bonsor, H., of Moseley, Birmingham. No. 11,885; June 10, 1901.

The illustration shows this arrangement of stove. The patentee proposes, in place of the ordinary asbestos, to use tubes made of silica, fire-clay, metal, or other suitable material, curved so that a portion of each length projects over the burner, the flame of which impinges directly upon the outside surface of the tube. Each tube is open at both ends to the external air; one end being below the level of the burner, and the other some distance above it. The portions of the tubes upon which the flames of the burners impinge are by this



means "brought to a glowing heat," and act as substitutes for the asbestos. The heating of this portion of the tubes causes a continuous current of air to pass through them; the cool air entering at the bottom ends of the tubes being given off into the room at the upper ends of the tubes in a heated condition. The burners (of the usual atmospheric type) are connected with a flue or chimney in the ordinary way, to carry off the products of combustion. The tubes rest on seatings or supports, which allow of their being easily removed and replaced whenever renewal becomes necessary.

Separation of Sulphuretted Hydrogen from Gaseous and other Fluids and its Desulphurization.—Hemingway, H. W., Walthamstow. No. 12,093; June 13, 1901.

This invention relates to the treatment of coal gas and ammoniacal liquor containing sulphuretted hydrogen, with the two-fold object of separating and removing the sulphuretted hydrogen and of desulphurizing it.

In treating ammoniacal liquors, the patentee proposes to employ carbonate of iron or sulphite of iron prior to treating the liquor for the recovery of the ammonia. Or the materials mentioned may be employed in any of the well-known apparatus for purifying coal gas. Iron in either of these forms, of course, decomposes sulphide of ammonia, forming sulphide of iron, and when sulphite of iron is employed, free sulphur is also yielded, as described in patent No. 9432 of 1899.

In treating gas liquor, a sufficient quantity of carbonate of iron (preferably native spathous iron, ground as finely as may be convenient) is mixed with the liquor to be "sweetened," and agitated. In this way, the sulphide liquor, giving up its sulphur to the iron, forms sulphide of iron and carbonate of the alkali.

The ammonia going to the saturator, stills, or elsewhere, and being freed from its sulphur, is, however, comparatively sweet, so that, on the addition of any acid in the subsequent treatment, there is no sulphuretted hydrogen to escape as under the present methods. The carbonate of iron, after having been exposed to the sulphide liquor, will be found to be coated with sulphide of iron, which, on exposure to the atmosphere, becomes ferric oxide and sulphur. This ferric oxide coating shrinks in the process of drying, and exposes a new surface of carbonate of iron. This dried and revivified material may, says the patentee, be applied to a further and similar quantity of gas liquor; and the process is repeated until it is found that the quantity of free sulphur present with the iron renders the latter of sufficient value to be burnt or treated for the recovery of the sulphur. In some cases the carbonate of iron is dried in the vessel in which it has been used in the treatment of the sulphide liquor; and, after admitting air so as to oxidize the iron, a fresh supply of liquor is run on.

Prepayment Gas-Meters.—Cowan, W., of Edinburgh. No. 12,348; June 17, 1901.

This invention relates to devices for actuating the prepayment or measuring-out mechanism of various forms of coin-freed gas-meters, in which a pointer and scale price-varying mechanism is employed. The first part consists in applying a pointer and scale-device in direct connection with a coin pocket or receiver of the type adapted to rotate always in one direction for actuating the gas prepayment mechanism. Such a pocket may be said to be always set or ready for the reception of a coin, without requiring to be returned to its initial position by rotation in the reverse direction. The second part relates to the price-varying mechanism to which the pointer-and-scale device is applied, and has for its object to permit of a large range of price variation.

The accompanying illustrations show its application to prepayment meters of the kind described in patents Nos. 18,727 of 1899 and 23,248 of 1900, in which the pointer-and-scale device is applied indirectly to the coin-pocket mechanism—*i.e.*, through gearing or by means of a prolonged shaft. Figs. 1 and 2 are an end elevation and plan of one form of the mechanism. Fig. 3 is a front sectional elevation of fig. 2.

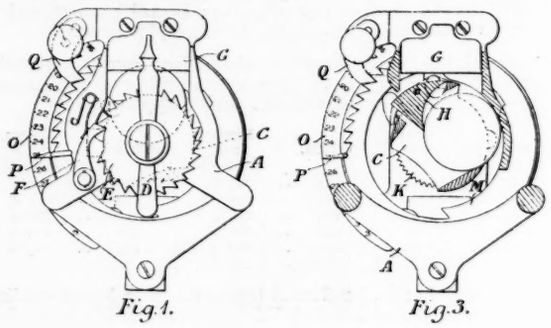


Fig. 1.

Fig. 3.

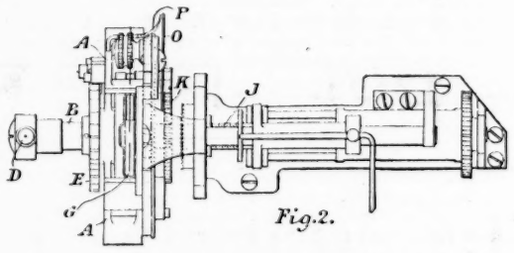


Fig. 2.

The frame A supports a shaft B, to which is fitted a coin-pocket C. This shaft is provided at its outer end with an operating handle D, and has secured it to a ratchet-wheel E, with which co-operates a spring-pressed pawl F pivoted on the frame. The pawl prevents a reverse rotation of the handle in all but the initial position, where a slight amount of freedom of movement in either direction is allowed to enable the coin-pocket to be brought into register with the fixed shoot G above the pocket when a coin is inserted; and for this purpose a few of the teeth are omitted from the ratchet-wheel. Within the coin pocket is pivoted a pawl H, which normally projects from the circumference of the pocket, and is preferably held in this position by a spring. A fixed segmental piece or roof is provided on the frame under which the coin in the pocket is forced when the handle is turned in the forward direction. The coin, in passing under this segmental roof, presses against the arm of the pivoted pawl, which is thereby withdrawn within the circumference of the pocket—thus enabling the pocket to be turned round.

The measuring-out shaft J, which is fitted with the usual divided-nut gas measuring-out device geared to the meter mechanism, is actuated by a toothed wheel K. This shaft, which is separate from the coin-pocket shaft B, is shown arranged axially in line with the latter, as adapted for a meter in which the operating handle is placed at the side of the meter-case; but where the handle is arranged at the front of the case, the measuring-out shaft is split into two parts geared together by bevel-wheels.

The measuring-out wheel carried by the shaft J is actuated from the coin-pocket by a driving pawl, which is brought into engagement with the wheel throughout a variable portion of the revolution of the coin-pocket. The pawl is attached to a small lever pivoted on the coin-pocket, and is carried round by the latter. It is normally held out of engagement with the measuring-out wheel by means of a spring.

When a coin has been inserted in the coin-pocket, and the latter is turned, the driving pawl is depressed by the segmental roof and guide-plate M. The driving pawl is thus caused to engage with the teeth of the measuring-out wheel, thus driving the latter through a predetermined arc, dependent on the position of the adjustable guide M, and prepaying the quantity of gas. When the coin-pocket has been turned

through the predetermined arc of engagement between the driving pawl and measuring-out wheel, the former clears the end of the guide-plate, and the spring takes the pawl out of contact with the teeth of the measuring-out wheel. The coin will before this have fallen out of the pocket. In order to ensure that the pawl shall pass out of engagement with the wheel at this stage, there is a spring with which the enlarged extremity of the lever is forced into contact by the rotation of the coin-pocket.

In order to indicate the amount of gas to be delivered for the coin, the guide-ring has attached to it a scale O, which moves under a fixed pointer P attached to the frame. By turning round the guide-ring, the length of arc under which the driving pawl has to travel before release can be increased or diminished as required. Thus, by simply setting the price-varying device by means of the pointer and scale, the quantity of gas to be delivered for the coin can be varied at will. But in order to enable the moveable guide-plate M to be locked in any desired position, the periphery of the ring is provided with teeth with which a pawl Q pivoted on the frame engages.

The second part of the invention relates to the pointer-and-scale device described with reference to the first part of the invention, and has for its object to increase the range of delivery of the prepayment mechanism. This part of the invention consists in providing two or more moveable segment guide-plates, so arranged as to form (when extended) a continuous guide through the greater part of the circle—thus enabling a large quantity of gas to be prepaid for each coin. When a guide of this construction is employed, it equally suits for the delivery of a very small quantity of gas for each coin when this is required, as with the same maximum range a smaller fined arc can be used, thus giving a smaller minimum limit.

The third part of the invention relates to a device for preventing fraud in prepayment meters—more especially of the type in which the coin-pocket is rotated always in one direction, and where it is not desired to employ an external curved or angled shoot for the coin. This consists in applying a shutter, which entirely closes the shoot except for a very small part of the rotation of the coin-pocket near the point where the coin is inserted into the pocket. According to one modification, a plate is provided hinged on a vertical axis, so as to pass across and entirely close the coin-shoot. The plate is provided with a curved projection on the opposite side of its hinged point, and an arm secured on the coin-pocket holds the shutter closed until the opening in the coin-pocket has passed away from the fixed coin slot. But when the revolution of the coin-pocket is nearly completed, the projecting arm engages the curved end of the hinged shutter, and opens it for the insertion of another coin.

Utilizing the Waste Heat from Gas-Fires.—Wright, J. W. B., and Darwin, H., of Birmingham. No. 13,611; July 4, 1901.

In order to provide the usual construction of gas-fires with means whereby the waste heat escaping to the flue is utilized to heat the apartments in which fires or stoves are fitted, the patentees propose to cause the hot products of combustion to descend behind the fire-brick back and circulate through radiating tubes or flues connected to the ordinary flue-pipe; the pure air entering the casing which encloses the back of the stoves, "becoming heated as it circulates between the radiating flues, and issuing from the stove in a heated condition into the apartment."

Manufacture of Water Gas.—Boult, A. J., a communication from J. E. Goldschmid, of Frankfort-on-the-Main. No. 14,653; July 18, 1901.

A lengthy, but very interesting, specification has been filed in reference to this patent. It is, however, not illustrated. The principal claim is in these words: "A process for the production of a mixed gas containing only about 25 per cent. of nitrogen from mineral coal or the like, characterized by the customary starting blast and gas period of the water-gas process being associated with a third gas period in which a combustible gas is produced and the distillation of the coal is supported by air supplied in a quantity smaller than that employed for the ordinary blast operation—the air being slowly blown in together with steam, if desired."

The object of the process is twofold: 1. To produce a so-called three-quarter water gas, composed of 25 per cent. of nitrogen and 75 per cent. of combustible gases (CO, H, CH_4, and the like), thereby essentially differing from the ordinary mixed gas—say, Dowson gas—which contains 50 per cent. or more of nitrogen. 2. To produce the new gas not only—as in the case of Dowson gas—from coke or anthracite, but also from ordinary mineral coal or bituminous fuel.

The essential features of the process may be described as follows: A layer less than 2 metres high of the combustible material in an incandescent state is first subjected to a strong blast of air. As set forth in Dellwik's patent No. 29,863 of 1896, the blast is to be so operated as to cause carbonic acid gas to preponderate over the carbonic oxide in the escaping gases. After the fresh fuel is thrown in, the flue-valve is closed and the gas-valve opened. By considerably reducing the section of the tuyere openings, and slowing down the blast-engine, a quantity of air (suitably diminished against the volume previously injected) is blown in, and, in the nature of things, mostly burned to carbonic oxide. The "generator gas" thus produced is conveyed to the holder. To distinguish it from the first or preliminary blowing period (the "primary blast"), the second blowing period is called the "secondary blast" by the patentee. However, since it is intended to likewise produce water gas for the purpose of mixing it with the generator gas, steam is sent through the layer of incandescent material, either before or after the "secondary blast." As soon as the decomposition of the steam is perceived to decrease, owing to the cooling down of the layer of fuel, the run is finished, and another run started by going back to the "primary blast."

In order to turn the heating capacity in the fuel to the utmost account and to cause the resulting "three-quarter water gas" to contain no more than 25 per cent. of nitrogen, it is indispensable (says the inventor) that the quantity of air introduced in the secondary period shall be smaller than that injected in the primary or preliminary part of the run. The air injected in the secondary period may be reduced, in fact, to one-half the former quantity; and in no case should it exceed three-fifths of the volume of water gas. This applies more especially when the primary blast is made to generate carbonic acid according to Dellwik's patent already referred to. Where the carbon is burnt to carbonic oxide in the primary as well as in the secondary blast periods, and equal quantities of air used on both occasions, 67 per cent. only of the heating capacity in the fuel could, at the utmost, be made available in the formation of the mixed gas. In that case, the resulting gas, instead of containing only 25 per cent. of nitrogen, will contain nearly 40 per cent., and, indeed, be but little better than Dowson gas. On the other hand, if the same quantity of air is equally injected in the primary and secondary blast, and carbonic acid be produced on both occasions, the utilization of the heating capacity in the fuel is easily carried up to 90 per cent., owing to the increased decomposition of steam. Still, the mixed gas resulting from the process is found to contain no less than 31 per cent. of nitrogen. Only of the proportion of the quantities of air used in the primary and secondary blasts is fixed at about 2 to 1, the utilization of the heat reaches its maximum figure of 90 per cent., and a mixed gas is obtained showing only 23·1 per cent. of nitrogen, and justifying therefore the name of three-quarter water gas.

Accordingly, in the new process, a third period is added to the two customary periods of the kindling and the steaming blasts. A useful gas being likewise produced in this additional period, there are consequently two gasing stages under the present method. The object of this insertion of another gasing stage is, in the first place, to prolong the time for the distillation of the mineral coal—a process specially favoured by blowing far more carbonic acid than carbonic oxide under Fleischer's patent of 1899 [see "JOURNAL" for March 6, 1900, p. 613]—and, secondly, to further promote distillation by starting it with a low supply of heat through arranging the additional gasing period to follow after the steaming period. Supposing both the secondary or gas blast period and the steaming period to last 15 minutes each, the coal will be effectually coked during four times 15 minutes by the passing water and generator gases, before it is burnt to carbonic acid in the subsequent primary blast.

Although it is quite possible to produce three-quarter water gas from mineral coal by means of a single generator, provided that the two blast periods are carried out in the manner and under the conditions described, yet, when employing mineral coal, it is more rational to make use of twin generators. A twin arrangement of this kind consists of two independent generators, each provided with all the necessary air and steam conduits, gas and flue or escape valves, and communicating with each other only by a passage arranged above the layers of fuel.

In now describing his method of carrying out the new process, the patentee calls one of the twin generators A and the other B. He says: Let it be assumed that both generators are charged with a layer of incandescent coal 1 to 2 metres deep. First, a strong blast is started in A with the tuyere fully open, which will produce carbonic acid. While keeping up the blast, the quantity of air introduced into A is guaged (say) by registering the number of strokes of the blast-engine. The gases issuing from A are either allowed to pass away as waste through the opened escape-valve, or are made use of for the purpose of preliminarily heating water or superheating steam. At the conclusion of the primary or starting blast period, the air-blast slide of A is closed; the blast is stopped; and a layer of fresh coal is introduced in A, while the escape-valves of both generators are closed and the gas-valve, which is connected with the ash-pit of A, and which closes the passage of the gas to the holder, is opened. During the secondary or gas-blast period now following (the object of which is the production of carbonic oxide), the air may be introduced either directly to A or through B. It is, however, preferable to pass the blast into the body which has not yet received the preliminary blast. Accordingly, the blast is turned on through B, the quantity of air introduced being less than (preferably only half) the quantity introduced into A during the previous blast. In order to be able to supply this quantity with some measure of exactness, the blast is introduced much more slowly than in the previous blast period (at about one-eighth the speed), while the slide in the tuyere is so far closed as to cause in the blast-conduits the same pressure as during the previous primary blast. During this time, the number of strokes of the blast-engine are again counted; and, when their number reaches one half of the number obtained in the primary blast, the blast is stopped. In this manner, half the quantity of air which had been passed through A during the primary blast period is slowly driven through during the secondary or gas-blast period. The generator gas thus obtained passes through B, crosses over at the top into A, where it greatly assists in the combustion or coking of the charge of fresh coal, descends through A (in the course of which the tarry vapours of the coal, on coming in contact with the hotter coke-layers, through which they have to pass, are decomposed), until it arrives in the ash-pit of A, from which it passes, through the gas valve, into the scrubber and holder.

The proper quantity of air having thus been introduced, the gas-blast period is brought to an end, by stopping the engine and fully closing the blast slide or valve. Steam (preferably superheated) is now admitted, from below, to B, which passes along the same way as did the air before, and in doing so again powerfully contributes towards the driving out of any gas evolved from the coal in A. By thus introducing steam, water gas is generated; the generation depending on the consumption of the heat accumulated in the fuel. The cessation of the generation of water gas marks the conclusion of the whole process, after which the operations which characterize the various phases (primary or kindling blast, secondary or gas blast, and introduction of steam) are repeated in the same order, with the difference, however, that it is now B on which the primary blast is turned. It will be clear that the fresh coal with which A had been charged will twice be subjected to the process of distillation—viz., when hot

generator gas and again when the steam or water gas are passing through it upwards from below, whereby an even more energetic reaction is secured than was the case in the preceding phase. In this manner, four long periods for distilling the coal are obtained, before it is finally consumed in the blast producing carbonic acid. For this reason, the new process is said to be eminently adapted for the employment of mineral coal.

Concluding his specification, the patentee remarks: With reference to the product, three-quarter water gas may be claimed as a perfectly new description of mixed gas, not previously obtained by anybody else. Up to the present time, no mixed gas has been produced in a generator which contains appreciably less than 50 per cent. of nitrogen. While 1 cubic metre of Dowson gas (according to Fisher) contains only 1360 calories, 1 cubic metre of the three quarter water gas contains a combustion heat of more than 3000 calories—thereby well dividing the fields on which the one or the other should be employed. Finally, it may be observed that when the object of the gas blast (without steam injection) is only to obtain generator gas, this may be employed for the production of the necessary quantity of steam, as well as for driving, by means of a gas-motor, the blast apparatus. In this manner, a gas is obtained which contains even less nitrogen in proportion, while the heat obtained from the coal is decreased only by a small percentage, turned to account in the production of steam and motor power.

Manufacture of Gas.—Clark, A. M.; a communication from J. E. Goldschmid, of Frankfort-on-Main. No. 14,759; July 19, 1901.

It is known (says the patentee) that, by admitting water gas into an illuminating-gas retort during distillation, "a very favourable influence may be exercised upon the progress of the distillation." One result in particular is an increased percentage of the heavy hydrocarbons in the products of distillation, whereof the volume remains practically unchanged, "while no graphite or naphthalene precipitates are formed." The difficulty lies in so proportioning and regulating the supply of water gas that the heavy products distilling from the coal shall not undergo decomposition—in other words, that the heavy hydrocarbons shall escape from the retort undecomposed, and that the gaseous mixture shall, none the less, preserve its illuminating power.

It has already been recognized that the object of the admission of water gas can only be attained on condition that such admission takes place simultaneously with the evolution of heavy hydrocarbons, and that it is essential that the gases be allowed to remain in the heated retort only during as brief a period as possible. But this is not all that is required, the patentee remarks. "It would be easy to secure the best effect of distillation as regards the amount of heavy products separated, were it feasible throughout the entire process to send unlimited quantities of water gas through the retorts. This desideratum might be fulfilled, for example, by distributing a quantity of water gas, equal to the total volume of distillation products, uniformly over the whole time occupied by the process of distillation. The extent to which water gas may practically be mixed with illuminating gas, however, is limited—indeed, what has to be considered in this connection is, not only that too large an admixture must effect a diminution of both the heating power and the illuminating power, but that the greater noxiousness, which the admixture produces by increasing the proportion of carbonic oxide, gives cause for apprehension. At least, this apprehension is still existing to-day. The addition of water gas, or the amount of such gas that should be present in the final products, may only, therefore, vary within predetermined narrow limits. The quantity of water gas admissible with safety may, in fact, be set down as not exceeding 30 to 40 per cent."

Now the quantity of water gas admissible must be properly utilized, the specification points out, in order to produce as beneficial an effect as possible upon the generation of gas in the retort during the evolution of the heavy hydrocarbons. This effect is, however, dependent, not merely upon the length of time for which the gases remain in the retort, or the velocity of their escape, but also upon the proportions in which gases of different nature are admixed. In other words, the heavy gases are less affected and decomposed by the heat, according as they are more diluted with other gases, especially light gases such as H, CO, or CH_4. Whether the effect of such dilution be purely physical or chemical, may for present purposes be regarded as immaterial. However this may be, it has been observed that, when a certain degree of dilution is attained, there is no longer any appreciable decomposition. It follows from this that the introduction of the water gas which it is desired to add need only be continued so long as that degree of dilution has not been attained through the action of the products of distillation themselves. The variation of the proportions of the heavy and light gases in the mixture being, indeed, similar for all kinds of coal at the different periods of the process, may be taken to be approximately as follows: The highest rate of evolution of the heavy gases in proportion to the total quantity, is reached at the end of the first quarter-of-an-hour of the operation of the retort; at the end of the first hour, the rate of evolution of those gases will be found to have fallen to about two-thirds of that maximum; and at the end of the second hour, to less than one-half. The proportionate evolution of the light gases H, CO, CH_4 also attains a high degree during the first quarter-of-an-hour. After that, it continues to rise, though not at the same rate, until the end of the fourth hour is nearly reached. And this is how it happens that, after the first quarter-of-an-hour, the volume of the light gases is about nine times, after the first hour fifteen times, and after two hours twenty times the volume of the heavy gases. In the case of boghead coal, the proportion of heavy gases is, of course, three or four times greater.

Now the present invention is based upon the recognized fact that, towards the end of the second hour, the proportions of the mixture become such that decomposition of the heavy gases can no longer take place to any material extent, and that consequently the further admission of water gas may at this juncture be discontinued. Hence the necessity of distributing throughout the two-hours' period the total quantity of water gas to be added in as advantageous a manner as possible. In other words, the distribution should be so regulated that the most favourable proportion—viz., 20 to 1—shall be constantly ensured for the mixture. At the beginning of the distillation, when the evolution of the heavy hydrocarbons is greatest, the maximum amount of water gas should be added; while later on the relative amount should be steadily reduced, according as proportionately more light gases are evolved. Let H denote the quantity of heavy gases; L the quantity of light gases; and W the quantity of water gas. Then the amount of water gas will be determined by the formula $H : L + W = \text{const.}$

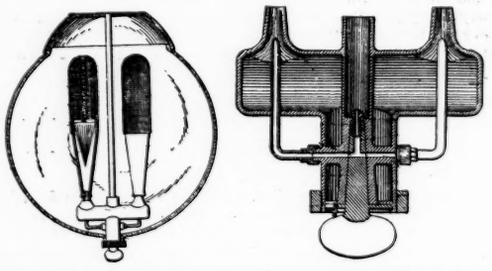
If the total amount of water gas admissible to the mixture be set down at one-third of the total volume of gas evolved in the retort, this would point to the conclusion that this amount should be so distributed that there should be a constant twenty-fold dilution of the heavy gases, by the light gases generated in the retort *plus* the water gas added. In this connection, it should be further noted that undoubtedly the admixture of water gas not only hinders the complete decomposition of the heavy gases, but also interferes with the partial decomposition resulting in the formation of CH_4; so that there would remain less CH_4 and more heavy gases, where water gas is admitted, than there would be without such admission.

During the first quarter-of-an-hour or thereabouts, the volume of water gas added should be equal to the total volume of gases evolved, and thereafter to about the end of the first hour the volume should be reduced by one-half, while by the end of the second hour it should have fallen to zero. It will be seen that the volume of illuminating gas produced in the first hour will be about one-and-a-half times that produced in the second hour. The limitation of the time for the admission of water gas to two hours is therefore the most important rule to be observed in this process. The mode of operation to be adopted within that limit of time would be as follows:

The admission of water gas should be commenced a few minutes after closing the retort, at the moment when the charge begins to evolve a somewhat considerable amount of gas; the proportion admitted being augmented very rapidly (at all events, within the first quarter-of-an-hour), until it becomes equal to the amount of gas generated in the retort, after which it should be gradually diminished until the end of the second hour is reached. An accurate and continuous regulation of the water-gas supply would be difficult, and is unnecessary; in practice, the desired regulation will be attained by periodical admission, preferably about two-thirds of the available water gas being taken during the first hour, and the remaining one-third during the second hour.

Incandescent Gas-Lighting Appliances.—Hughes, W. G., of Pittsburg, U.S.A. No. 21,244; Oct. 23, 1901.

This arrangement of globe light will be appreciated by a reference to the illustration. The gas is heated in the lamp-casing, and passes through the valve into the transversely extending ports in the air-chamber. From this point to the mixing-chamber, the gas is re-heated and the heated air within the chamber and the heated gas are mixed together, and pass unwardly through and between the fingers or lips of the metallic cone to the burner proper, "where perfect combustion takes place, illuminating the mantle and also the pencil or mantle



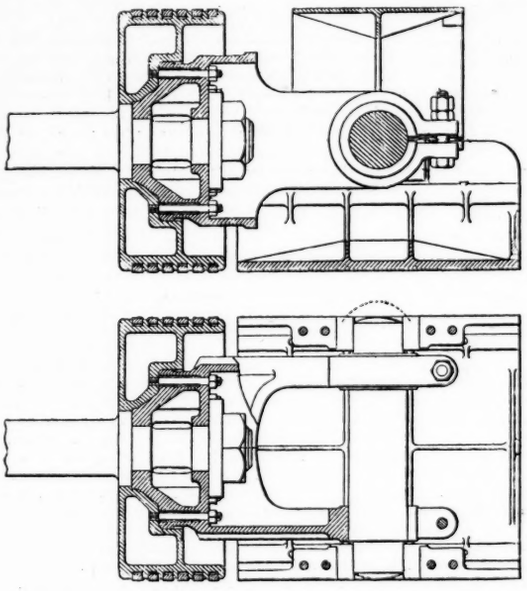
holder, the latter reflecting the rays against the walls of the mantle and adding brilliancy to the light." The quantity of gas and air admitted is simultaneously controlled entirely by the valve-tap. When this valve is in the open position, the ports will be in full registry with each other, admitting the full force of gas obtainable through the orifice in the screw. As the valve is turned so as to decrease the registering portions of the ports, the amount of gas admitted is decreased, and the quantity of air is simultaneously diminished owing to the partial closing of the ports. The full force of the gas is always flowing through the orifice in the screw; the amount, however, passing to the burner being dependent upon the extent of the registry of the several ports. When the pilot-light is burning, the regulating-valve is closed entirely; and as the valve is turned to open the ports for the gas, the air-ports will be opened so as to admit sufficient air to form the proper combustion mixture.

Single-Acting Gas or Explosion Engines.—Dudgeon, A. J.; a communication from the Société Anonyme John Cockerill and H. Savage, of Seraing, Belgium. No. 8581; April 12, 1902.

This invention in reference to horizontal single-acting gas or explosion engines, has for its objects to provide means whereby the piston may be adjusted or centred in the motor cylinder so as to take up the wear of the sliding face of the cross-head, or for other purpose, and also whereby the pressure on the piston due to its weight and that of the connecting-rod, and to the reaction arising from the inclination of the connecting-rod, may be taken off the piston and uniformly distributed on the sliding face of the cross-head.

As shown, the cross-head is made as a part distinct from the piston proper, and is connected to the piston by means of a coupling-piece in which the cross-head pin is mounted, thus allowing the piston to have a pivoting motion, to a certain extent, with respect to the cross-head. Bearings for the ends of the cross-head pin are provided in the

cross-head and in the coupling-piece. The bearings in the cross-head are adjustable, and those in the coupling-piece may be adjustable also. By means of the adjustable bearings, the cross-head pin (and consequently the piston) can be adjusted to be centred perfectly in the cylinder, and take up any wear of the sliding face of the cross-head. The piston-rod passes out through a suitable gland in the cylinder end,



and is connected to a slipper running on or in a slide at the rear of the cylinder. The piston is thus suspended at back and front—that is to say, at the front from the cross-head, and at the back by the slipper—and does not touch the cylinder-wall. It is consequently relieved of all unnecessary weight or strains.

Hot-Coke Conveyors.—Graham, M., of Leeds. No. 9136; April 19, 1902.

This invention relates to push plate conveyors for dealing with incandescent hot coke in connection with retorts, gas-works, and coke-ovens; the object being to provide means of supporting the endless travelling conveyor within the trough, and for efficiently lubricating the chain.

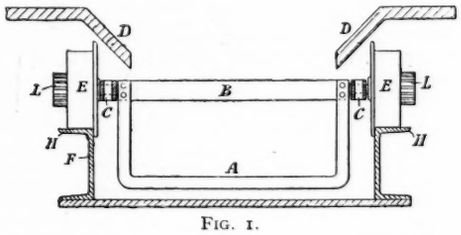


FIG. 1.

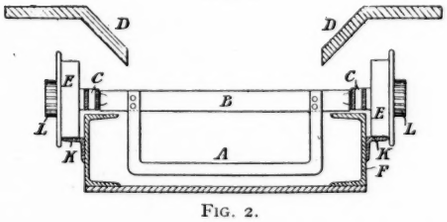


FIG. 2.

In the two forms of conveyor shown, A are the push-plates or scrapers, which are fixed to transverse bars B carried by the chains C, and which push the hot coke along within the trough F. D are the deflecting plates. The chains are carried by rollers or runners E, attached at suitable intervals to the chains, and which bear on the top flange H of the trough (as in fig. 1), or on an outside bracket K fixed to the trough (as in fig. 2). This arrangement permits of the employment of lubricators L, provided for each roller or runner E, and of any suitable type.

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13,144.—KEITH, J. & G., "Incandescent lamps." June 10.

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13,684.—HAMILTON, J. H., "Gas-driven blowing engines." June 17.

13,698.—MILNE, J., "Wet meters for gas or other fluids." June 17.

13,750.—SEYMOUR, J., "Mixing gas and air." June 17.

13,754.—HOOKER, W., "A combustible vapour for incandescent lighting." June 17.

13,760.—LANCHESTER, F. W., "Gas and oil engines." June 17.

13,785.—KITSON, A., "Vapour-burning apparatus." June 17.

13,793.—HIORTH, L. T. H., "Burners for incandescent gas lighting." June 18.

13,800.—FROST, W., "Bye-pass gas tap or cock." June 18.

13,820.—BATCHELOR, I. G. H., "Compound high and low temperature combustion engine, having a one-revolution cycle." June 18.

13,879.—WOLFF, A., "Gas generators or carburettors." June 18.

13,883.—CROMPTON, J. H., "Pipe applicable to radiating, cooling, heating, condensing, and the like, also for conveying liquids." June 19.

13,902.—HOLGATE, T., "Burners and lanterns for incandescent gas lighting." June 19.

13,913.—CAPITO, C. A. A., "Gas and other engines." June 19.

13,946.—BOUSFIELD, J. E., "Regulating the supply of air to gas-motors." June 19. A communication from E. W. Hopkins.

13,954.—DARGIE, J., "Acetylene generator." June 19.

13,960.—WEST, J., "Charging and drawing gas-retorts." June 19.

13,996.—FLETCHER, A. E. & B. M., "Generating gas from coal, wood, peat, or other similar substances." June 20.

14,057.—JOHNSON, J. Y,, "Production and supply of explosive gases." A communication from the Compagnie Française de l' Acétylène dissous." June 20.

14,077.—WHITFIELD, C., "Gas-producers." June 21.

14,088.—RIEHL, J. B., "Incandescent gas-burners." June 21.

14,113.—MICHAELIS, H., "Self lighters for gas-lamps." June 21.

14,120.—HAWKINS, H. & S. H., "Acetylene generators." June 21.

14,146.—ROSS, M. L., "Burners for gas-stoves." June 21.

14,166.—CROSSLEY, W. J., and RIGBY, T., "Gas-producers." June 23.

14,167.—CROSSLEY, W. J., and RIGBY, T., "Removing impurities from gases." June 23.

14,178.—BOULT, A. J., "Fittings for incandescent gas lighting." A communication from M. D. Compton. June 23.

14,192—BOOTH, J., DUGARD, W. F., and RAYBOULD, A., "Suspension gas-lamps." June 23.

14,218.—ROBERTS, D., and HORNSBY, J. W., "Gas-engines." June 23.

14,287.—GILGAN, P., "Acetylene gas-generator." June 24.

14,309.—PRATT, A. A., "Incandescent gas-burners." June 24.

14,321.—GOARD, W. P., and MORGAN, A. G., "Ignition devices for lamps and lanterns." June 24.

14,327.—GARDNER, E. T. H., L., & J., "Internal combustion engines." June 24.

14,345.—BAUMGARTEN, H., "Generator for acetylene gas." June 24.

14,357—WRIGHT, J. W. B., and DARWIN, H., "Gas heating-stoves." June 25.

14,358.—WRIGHT, J. W. B., and DARWIN, H., "Gas cooking-ranges." June 25.

14,359.—WRIGHT, J. W. B., and DARWIN, H., "Atmospheric gas-burners for heating-stoves." June 25.

14,418.—THOMPSON, W. P., "Gas-burners." A communication from A. H. Humphrey. June 25.

14,419.—RICHARDS, W. A., "Measuring the flow of liquids." June 25.

14,429.—BACHNER, A., and BOUCHSEIN, P., "Flame igniters." June 25.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Hot-Coke Conveyors.

SIR,—I have been much interested in the various hot-coke conveyors which have recently been described in the "JOURNAL." The conveyor at the Cassel Gas-Works, illustrated last week, is the nearest I have seen to the one patented and erected at these works by Messrs. R. Dempster and Sons, Limited, of Elland. The latter, however, is much superior in many respects.

Thus, in my case, neither the chain nor forks can move sideways, and so catch or rub the trough. The chain has no projections, and is bound to travel parallel to the trough. The roller and bearings are outside the trough, and do not travel with the chain, which I consider also an important improvement. No heat can be transmitted through the forks and spindles to the roller bearings. The lubrication of the bearings is not affected by the heat, and can be applied at any time, whether the conveyor is working or not. No coke can form contact with the roller-bearings and be ground to fine dust, which causes so much wear and tear.

It seems to me that, for conveying hot coke, we can do better at home than any German plant can do for us. Our conveyor has been at work for eight months, and has not cost anything for repairs; and it still appears to be as good as the day it was put in. If any of your readers are considering this question, I shall be pleased to show them the plant here, and to point out its advantages.

Gas-Works, Heckmondwike, July 4, 1902. A. F. GOODSON.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

THE great misfortune which the nation has suffered since the last notes under this heading were penned seems to have dislocated work and business in every direction; and somehow or other, things do not as yet show any tendency to joint properly. Even in the Houses, there appears to be a disinclination to work; and little movement has yet been made to press forward the few Bills upon which further work remains to done. There is not now a single Gas Bill in the list which requires anything more than the Royal Assent for it to be entered in the Statute Books of the land; and there are but eleven Bills wholly or partly dealing with water which have further stages to pass through before they, if fortune favours them, reach the dignity of Acts. These Bills are the Consett Water, Devonport Water, Leicester Corporation, London Water (Purchase), Margate Water, Menai Bridge Water, Nottingham Corporation, Rhondda Water, Weardale and Shildon Water, Whitstable Improvement, and Ystradfellte Water. At the moment, we do not know of anything in connection with the majority of these Bills which is likely to raise much contention; but there is always a "glorious uncertainty" hovering over parliamentary proceedings.

Gas Companies and Rate-Aided Electric Lighting. The South Metropolitan Gas Company have scored a significant success in the House of Lords; and it is one of those successes which are fruitful of advantage beyond the enjoyment of the result by the victor, or even by the locality to which it particularly refers. It is a telling hit at municipal trading, and especially at rate-aided electrical supply; it protects the South Metropolitan Gas Company against having to contribute to the support of a competitor; and, in winning this protection, the Company have, as a consequence, defended all the non-electricity users of Bermondsey against having to furnish funds to an undertaking which they have had no part in creating, nor with which they have any relation as customers. But beyond all this, it is a precedent of inestimable value for all gas companies to work upon who object to the local authority of their district entering into hazardous ventures which, if unprosperous, will expose the gas company to a disproportionate and unfair burden. Gas companies are, as a rule, the largest ratepayers in the district in which they carry on their operations; and when the local authority enter into the speculative business of electric lighting, it comes hard on the gas suppliers that they should be compelled, if the electric undertaking is unfortunate, to subscribe the largest part of the amount necessary to keep it—their competitor—in a solvent condition. This is a long-standing, indefensible feature of municipal trading, but one which the South Metropolitan Gas Company have now done their part in breaking down.

The Facts of the Case. The line of argument briefly stated above was the one which was successfully urged by Mr. Balfour Browne, K.C. (who had with him Mr. L. W. S. Rostron), on behalf of the Company, when on Wednesday last, the Bermondsey Electric Lighting Order came up among others in a Bill for confirmation by a Lords Committee, of which the Earl of Erne was the Chairman. The Order is to empower the Bermondsey Corporation to purchase the Rotherhithe portion of the undertaking of the London Electric Supply Corporation. Now Rotherhithe is the richest part of the Gas Company's area in Bermondsey; and the Company are the payers of thousands of pounds annually in rates—in fact, in Bermondsey they hold the premier position in that respect. If therefore, there was loss on the Local Authority's electric lighting venture in Rotherhithe, they would, as the Order came from the Board of Trade, have been the hapless and helpless contributors of the largest sum to compensate that loss. Yet they have not the slightest interest in the electrical undertaking beyond that of wishing it was (say) in Jericho instead of in Bermondsey. An ugly feature of this purchase by the Bermondsey Corporation, and one which involves the venture in greater financial uncertainty, is the fact that a second Company has the right to supply electricity in the same area. Their Lordships listened to the appeal of the Company, saw its reasonableness, and ordered the insertion in the Order of a clause which will ensure that the electrical undertaking is self-supporting. Parliament as a Court of Appeal from the Board of Trade is a useful institution.

The Deficiency-Preventing Clause. We have emphasized the import of this South Metropolitan victory over municipal trading at other people's expense; and the mere reproduction of the clause inserted in the Bermondsey Order will convey to all gas companies the full weight of its value to them as a precedent when opportunity gives them the power of making use of it. It is worded as follows:—

> The undertakers shall once in every year, after the first year's working of the undertaking, cause to be laid before them a statement and balance-sheet of the accounts of the undertaking drawn up in accordance with the form of accounts prescribed by the Board of Trade for a local authority under the Electric Lighting Acts, 1882 to 1888; and the undertakers shall thereupon fix annually the charges to be made for the supply of energy in the then ensuing year at such rates (not exceeding the maximum rates specified in this Order), so that, as far as is reasonably practicable, the revenue for that year shall not be less than the expenditure for that year.

It will be seen that the Gas Company's object is gained by the compulsory annual fixing of the charges for electricity at such a rate as shall bring in sufficient revenue to meet all the outgoings of the year. Thus the users of Corporation electricity in Rotherhithe will have, as is only right, to pay the entire cost of producing the current. The clause insists on respect being shown to one of the soundest principles of trading; but in some cases its application would make it rather difficult for electric lighting authorities to get together such a big connection as they might otherwise do at the expense of people who are not electricity users. The old axiom that every tub should stand on its own bottom supplies a useful business rule; and it is certain that those in authority at Bermondsey will now have to see that the bottom of their Rotherhithe electrical tub, when purchased, is strong enough to support it without external aid.

An Ungrateful District Council. Whether justice would be done all round by the Thurmaston District Council being allowed to purchase a part of the undertaking of the Syston and Thurmaston Gas Company and obtain their gas supply elsewhere, is a matter that has been submitted to no less a tribunal than the House of Lords. To readers interested in the gas supply of large towns and cities, such a matter may seem a ridiculously small one to engage the attention of noble Lords. But it is a question of great moment to the Company named; and therefore Lord Erne and his colleagues gave to it serious consideration, and delivered what will generally be regarded as a very just decision. Over a period of 27 years, this is the first time that Thurmaston has essayed to get control of the gas supply; and there are two or three reasons why they have made an effort now, with a painfully weak case. The Company are in Parliament this session with a Provisional Order, which will convert the concern from a non-statutory to a statutory one. The Order came before their Lordships last Thursday in a Confirmation Bill. In the first place, the petitioners objected to the Company being cloaked with parliamentary authorization. Why they did so was not very clear at first; but it came out later. As a rule, one regards it as a virtuous thing for a joint-stock company to put themselves under the Gas-Works Clauses Acts of 1847 and 1871, seeing that, in so doing, the advantage to the company and the locality is mutual. However, after hearing a good deal about the bad gas which this Company are said to have been supplying (the remedy for which, if true, was to be found in the Order), it transpired that the District Council either wanted the area over which they have governing power cut out of the Order, or a purchase clause inserted—expressing themselves willing to pay every penny that was fair, provided the value was not enhanced by the passing of the Order. But eventually their Lordships got to the bottom of the whole thing. The Leicester Corporation have purchased a large site for new gas-works at Thurmaston; and the councillors of the place have a fancy for the cheaper gas supply of Leicester. No one will blame them for this, though it shows a little ingratitude on their part. But justice must be done though Thurmaston has to pay more for its gas; and so their Lordships decided not to deprive the Syston Company of (to them) an important part of their area. We hope the ratepayers of Thurmaston will not deal too harshly with their councillors for spending money unfruitfully; but, to say the least, it was a hopeless task which they set out to accomplish, as those who have any knowledge of parliamentary matters know full well. Parliament are not in the habit of allowing old-established companies to be dismembered in this way.

Buxton Water Bill. Various references have been made in these notes from time to time regarding the progress of this Bill and the opposition it encountered, which ended in one of the petitioners being mulct in costs. Before leaving Mr. Johnstone's Committee, there were one or two matters dealt with on clauses which are of general interest. The borrowing power conferred on the District Council by the measure is £171,000; and, in connection with the increased liability which the new works will impose, the water-rate of the town may be raised by 6d. It was unanimously decided by the Committee that hospitals and public institutions shall not be charged more than 1s. per 1000 gallons, instead of 1s. 6d. as proposed by the promoters. The Council, however, have been given extended power in connection with the detection of leakage and waste of water throughout the town. There was some discussion over the question of the charges for baths. Buxton needs a considerable extra supply on account of the large quantity of water used for bath purposes in hotels and lodging-houses, the proprietors of which make a substantial profit out of the service. The Council therefore asked to be permitted to increase their charges; but the Committee declined, and so the present rates are to be continued.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported: Commercial Gas Bill, Gas and Water Orders Confirmation Bill (No. 2), Huddersfield Corporation Bill, Local Government (Ireland) Provisional Orders (Gas) Bill, Local Government Provisional Order (Gas) Bill.

Bills read the third time and passed: Commercial Gas Bill, Leamington Corporation Bill, Local Government (Ireland) Provisional Orders (Gas) Bill, Local Government Provisional Order (Gas) Bill, Ticehurst Water Bill.

A Bill to confirm a Provisional Order relating to the Glasgow Corporation (Gas, &c.) was presented last Friday by Lord Balfour of Burleigh, read the first time, and, pursuant to the Private Legislation Procedure (Scotland) Act, 1899, deemed to have been read a second time and reported from the Committee.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time and referred to the Examiners: Ystradfellte Water Bill.

Lords Bills read a second time and committed: Gas Orders Confirmation Bill (No. 2), Nottingham Corporation Bill, Weardale and Shildon District Water Bill.

Lords Bill reported: Paisley Gas Provisional Order Confirmation Bill.

Lords Bills read the third time and passed: Buxton Urban District Council Bill, Paisley Gas Provisional Order Confirmation Bill.

The Devonport Corporation Water Bill [Lords] and the Margate Corporation Water Bill [Lords] have been referred to a Select Committee, consisting of Sir James Woodhouse (Chairman), Mr. Allhusen, Mr. Joseph Walton, and Colonel Sadler; to meet next Thursday.

HOUSE OF LORDS COMMITTEE.

Thursday, July 3.

(*Before the Earl of* ERNE, *Chairman, the Earl of* BATHURST, *the Marquis of* BRISTOL, *the Marquis of* WINCHESTER, *and the Earl of* GALLOWAY.)

GAS AND WATER ORDERS CONFIRMATION (No. 2) BILL. (SYSTON AND THURMASTON GAS ORDER.)

This was a Bill to confirm certain Provisional Orders made by the Board of Trade, among them being one promoted by the Syston and Thurmaston Gaslight and Coke Company. Its object was to empower the Company to maintain and continue gas-works, and to manufacture and supply gas in the urban district of Thurmaston, and the parishes of Syston, Barkby Thorpe, and Queniborough, in the county of Leicester.

Sir RALPH LITTLER, K.C., and Mr. ACKWORTH appeared for the promoters; and Mr. VESEY KNOX represented the petitioners—the Thurmaston Urban District Council.

Sir R. LITTLER, in opening the case for the promoters, explained that they were a joint-stock Company and their desire was to put themselves under parliamentary authorization. This would entail obligations and confer privileges; but the petitioners regarded this as a very wicked thing to do. The area of supply had been extended from Syston to Thurmaston; a new Company having been incorporated, with a nominal capital of £5000. In 1886, the capital was increased by £2500, and again in 1895 by another £2500; so that the capital was altogether £10,000. This had not been sufficient to enable the Company to carry out all the works necessary, and another £2500 was urgently needed. It had become obvious, as the undertaking was growing, that it would have to be placed under statute law. The capital raised in 1896 had been spent in reconstructing the works and placing them in a thoroughly good condition. It could without fear of contradiction be said that the works were now as modern and complete and efficient, for their size, as any which could be found anywhere in the country. As they required capital, the Company had gone to the Board of Trade for a Provisional Order, and had asked for £18,000 capital. This would be sufficient to carry them on for eight or ten years. The Company in the Bill put themselves under the auction clauses, and proposed that on the original capital they should be limited to 10 per cent. dividend, and on the new capital to 7 per cent. There would be clauses in the Bill for the protection of Leicester; and the quality of the gas to be supplied would be fixed at 15 candles. The price would be limited to 4s. 3d. per 1000 cubic feet. At present, it was 3s. 9d.; but that did not leave sufficient margin for a rise in the price of coal. The average dividend of the Company was about £5 4s.—a very moderate dividend indeed. The receipts from Syston were £1337, from Thurmaston £323, and from Barkby £129. A Board of Trade inquiry had been held into this Provisional Order; and the scheme had received the assent of the Government Department. But at the inquiry, much to the surprise of the Company, complaint had been made of the supply of gas to Thurmaston. It was said that the pressure at which the gas was supplied was not sufficient. The answer to that was that what the Company wanted was more capital to fully and efficiently carry on their works. They wanted to spend more money, and to be protected by parliamentary provisions. The Thurmaston Local Authority were now anxious to get the Committee to leave their district out of the Bill; Leicester having purchased a large piece of land in the place for the extension of their gas-works, and Thurmaston, forgetful of its obligation to the Syston Gas Company in the past, wishing to get a cheaper supply of gas from Leicester, to be distributed by themselves—Leicester having no statutory powers in the district at present.

Mr. KNOX said his clients had always said that they were willing to pay the full value of all the works of the promoters which might be taken over by them.

Mr. *Henry Nuttal*, M.D., a Director of the Company, examined by Mr. ACKWORTH said that the object of forming the Company had been more the lighting of the district than the making of a commercial profit. If Thurmaston were struck out of the area of supply, he should not like to take any of the proposed new capital. It would unfairly handicap the Company.

Mr. KNOX said that all his clients asked for was that they should be left out of the limits of supply of the Company, or, if they were included, that a purchase clause should be put in for the benefit of Thurmaston.

In cross-examination, witness said he did not think there would be such a prospect of increased demand for gas in Syston as to justify the Company being carried on as at present if the Thurmaston district were omitted. The charge for gas for manufacturing purposes by Leicester was 2s. per 1000 cubic feet; whereas that of his Company was 3s. 6d. There would be no inducement to a manufacturer who used gas to start a new factory in Thurmaston while the present prices prevailed there.

Sir R. LITTLER: I would like to ask my learned friend if he could find me a precedent where a part of a district actually supplied has been struck out of the limits of any Act, or where a part of an undertaking had been purchased against the will of the proprietors. I know of none.

Mr. VESEY KNOX: There are cases. Golborne last year was one.

Sir R. LITTLER: If that is your only case, I am content.

Mr. *T. J. Main*, Secretary, also gave evidence in support of the Bill. He stated that the capital, with regard to which power was sought, was absolutely necessary for the purposes of the works. The sale of gas by the Company last year was about 9 million cubic feet.

Mr. VESEY KNOX, in reply to the Chairman, said he had a gentleman connected with the Leicester gas works present, who would give an undertaking that, if the Committee did not include Thurmaston in the Company's boundary, the Leicester Corporation would apply to Parliament for powers to supply in that district; thus giving Thurmaston the benefit of the reduced price being charged in Leicester.

The CHAIRMAN said the Committee could not enter into what Leicester meant to do.

The CHAIRMAN intimated that he thought there was no need for the promoters to call more witnesses.

Evidence for the petitioners was then taken.

Rev. *George Chappell* and Mr. *Benjamin Lane*, the Chairman of the Thurmaston Urban District Council, gave evidence for the purpose of showing the quality of the gas had been unsatisfactory. The last witness also stated that there was a very earnest desire in Thurmaston in favour of the District Council being able to supply gas to the consumers; and the Council were willing to pay the Company the full value of the portion of their undertaking, including goodwill, under the provisions of the Lands Clauses Act—providing, however, that the cost was not enhanced by the passing of the present Bill.

Further evidence of the same character having been given,

Mr. VESEY KNOX addressed the Committee; his chief contention being that a purchase clause should be inserted, enabling the Council to purchase the portion of the Company's concern which related to their area. He admitted that there was no precedent, absolutely on all-fours with such a proposal, but urged that the circumstances here were exceptional.

The Committee, without calling on Counsel for the promoters, found the preamble proved; and, the clauses having been adjusted, the Bill was ordered to be reported to the House.

HOUSE OF LORDS COMMITTEE.

Wednesday, July 2.

(*Before the Earl of* ERNE, *Chairman, the Earl of* BATHURST, *the Marquis of* BRISTOL, *the Marquis of* WINCHESTER, *and the Earl of* GALLOWAY.)

ELECTRIC LIGHTING PROVISIONAL ORDERS (No. 8) BILL (BERMONDSEY ORDER).

The object of this Bill, among other things, was to confirm a Provisional Order granted by the Board of Trade, under the Electric Lighting Acts, 1882 and 1888, to the Corporation of Bermondsey for extending their area of supply to the parish of Rotherhithe, in the borough of Bermondsey.

Sir RALPH LITTLER, K.C., and Mr. H. AVORY represented the promoters, the Bermondsey Corporation; Mr. BALFOUR BROWNE, K.C., and Mr. ROSTRON appeared for the opponents—the South Metropolitan Gas Company.

Counsel, in opening, called attention, in particular, to section 6 of the Bill, which set forth: "If within six months after the commencement of this Order the London Electric Supply Corporation, Limited, serve on the undertakers notice, in writing, requiring them to purchase so much of the undertakings of that Company authorized by the London Electric Supply Corporation Electric Lighting Order, 1899, and the Order of 1890, as is comprised in the parish of Rotherhithe (in this Order referred to as 'the Rotherhithe part of the Company's undertakings'), the undertakers shall purchase, and the Company shall sell to them, the Rotherhithe part of the Company's undertakings (including all lands, buildings, works, materials, and

plant situate in the parish of Rotherhithe and suitable to, and used by, the Company for the purposes of the Rotherhithe part of the Company's undertakings) upon the terms of the undertakers paying to the Company the fair market value of the Rotherhithe part of the Company's undertakings as a going concern; that value to be determined, in default of agreement, by arbitration." It was pointed out that the petitioners—the South Metropolitan Gas Company—in their petition set forth that they were the owners of large gas-works in Bermondsey, and that their property differed from the ordinary rateable property of the borough, and their interests differed materially from the interests of other owners and ratepayers in the borough, as they derived no advantage from the objects to which the rates of the borough were applicable, and were especially affected by the provisions of the Bill. The petitioners pointed out that they supplied light and motive power, and that the Bill would enable the Corporation to compete with them. They were the largest ratepayers in the borough; the rateable value of their property being £17,282, and the amount contributed by them towards the rates was £8000 per annum. They proceeded to say that they were advised and believed that the undertaking of the Corporation could not be remunerative; that there would therefore be a charge on the rates; and that they (the petitioners) would be contributing largely towards the maintenance of a competition with their own undertaking. There were, they said, already two Companies authorized to supply energy within the district sought to be supplied by the Council; but in order to obtain the grant of the Order by the Board of Trade, the Council had entered into arrangements with one of these Companies whereby the undertaking of that Company was to be purchased by the Council, and clauses were contained in the Order to carry into effect such purchase. The petitioners submitted that the powers of purchase which were sought should not be granted, and that under the provisions of the general law now in force and applicable to the undertaking of the Company, the Council would have, at the expiration of the concession granted to the said Company the power to purchase the undertaking upon advantageous terms. The terms of purchase indicated in the Order, it was said, would involve the payment of a very large sum to the Company, and a consequential charge upon the electric undertaking of the Council and the rates of the Borough. In respect to this charge, there could be no corresponding benefit to the public or to the ratepayers. The petition further set forth:

The effect of the power so proposed to be conferred—of purchasing one of the two Companies—will bring the Council into direct competition with the other; and this will tend to the reduction of the price of electricity, and a consequently increased charge upon the rates to which your petitioners are such large contributors. Your petitioners submit that it is undesirable that undertakings, such as an electric light undertaking, which can be, and are being, adequately and properly carried on by private enterprise, should be in the hands of a local authority, or be conducted for the benefit of those who require and can afford electricity, at the expense of the ratepayers who do not require, or cannot afford to take, a supply of electricity. By the London Government Act, 1899, the provisions of the Borough Funds Act, 1872, have been specially applied to the Borough Councils created by the first-mentioned Act, and your petitioners submit that the powers now sought should have been sought by Private Act of Parliament, when the ratepayers of the borough would have had an opportunity of determining whether the Council should be authorized to spend the ratepayers' money in the purchase of the undertaking of the Company already authorized to supply electricity. The amount involved in such a purchase is very large; and your petitioners submit that the sums under consideration in respect of a similar purchase by a local authority in another part of London render it desirable that the ratepayers should be informed of the liability it is proposed to impose upon them. Your petitioners objected before the Board of Trade to the grant of the Order, and they humbly crave leave to refer to their objections and to the answers of the Council thereto.

Clause 15 of the petition said: "If the grant of the powers sought by the Order can be justified—which your petitioners deny—your petitioners submit that provision should be made in the Order to ensure that the price charged for electricity shall be such as will make the undertaking self-supporting, and that the powers of charging the rates with the deficiency in the income of the Councils' undertaking should not be sanctioned." In the next clause of the petition, the petitioners said that the form of accounts at present prescribed in respect of an electrical undertaking in the hands of a local authority was deficient, and did not cause the true state of the accounts to be properly disclosed, and there was no machinery under which any ratepayer charged with a rate in respect of a deficiency in the income of the undertaking could ascertain whether or not such deficiency had been properly incurred; and the petitioners submitted that, if the Bill were passed, there should be a provision inserted requiring the Council to keep sufficient accounts.

After hearing the case as submitted by Counsel, the Committee agreed to confirm the Order, on condition that a clause were prepared on the lines of the proposal contained in clause 15 of the petition.

Thursday, July 3.

On the resumption of the proceedings to-day,

Mr. BALFOUR BROWNE submitted a new clause to carry out the decision of the Committee. He said that in the clause his clients had followed the precedent set in several Tramway Acts, especially the Broughty Ferry Act; only that they had dealt with the supply of energy in place of fares.

Sir R. LITTLER opposed the clause as being unworkable and going too far, as it sought to give the Gas Company protection against an Order already in operation—viz., that applying to Bermondsey—whereas the present Order only affected Rotherhithe. Whatever form the clause took, he hoped the obligation would not be put on the Corporation to buy up the second Company, as the Board of Trade required in the Order, in direct contravention of the Act of 1888, which was passed for the purpose of promoting competition. For the Corporation, he submitted an alternative clause, which would provide that, after three years, if it should appear from the accounts of working that there was any loss on the undertaking in distributing electricity, the South Metropolitan Gas Company should not be charged any proportion of such loss in respect of their property in the parish of Rotherhithe. He objected to the Company making their clause general, so as to affect other ratepayers as well as themselves. They were in no sense commissioned to represent the ratepayers.

Mr. BALFOUR BROWNE held that the clause proposed by his clients should be adopted. It was in accordance with clause 15 of the petition, which was a general clause against municipal trading. He pointed out that the Corporation would be able to rate the Company in Bermondsey for the loss made in Rotherhithe under the proposal made by the promoters. A low rate might be charged for electricity, and the rates made to pay the loss. In his clause, the precedent of the Rochdale case before Earl Camperdown had been followed.

The room was then cleared. On the re-admission of the public,

The CHAIRMAN said the Committee had decided to retain clause 3, and to modify the section submitted to the Gas Company, so that it should provide that the undertakers should, every year after the first year's working, cause to be laid before them a statement of accounts on the system drawn up by the Board of Trade, and the undertakers should thereupon fix annually charges to be made for a supply of energy for the then ensuing year—the rates not to exceed the maximum in the Order, so that, so far as was reasonably practical, the revenue for each year should not be less than the expenditure for that period.

WOOLWICH ELECTRIC LIGHTING ORDER.

At the conclusion of the proceedings on the Bermondsey Order,

Mr. BALFOUR BROWNE said there was another Order in the Bill—the Woolwich Order—which he was instructed to oppose, as well as the Bermondsey Order; but as there did not seem to be any appearance of the promoters, he would ask the Committee to strike that Order out of the Bill.

The Order was struck out of the Bill accordingly.

LEGAL INTELLIGENCE.

CLERKENWELL COUNTY COURT.—Thursday, July 3.

(*Before His Honour Judge* EDGE)

Liability for a Supply of Water.

This was a claim made by the New River Company against Messrs. Nokes and Nokes, estate agents, of Caledonian Road, N., to recover £6 10s. 8d. for water supplied to three houses, in Copenhagen Street, Islington, for which they were the agents.

Mr. DEBENHAM appeared for the plaintiffs; Mr. EDGAR ROBINS represented the defendants.

Mr. ROBINS, in reply to his Honour, admitted that the rate was owing, and that it was a proper one; but he said the objection he put forward was that the plaintiffs had sued the agents instead of the occupiers.

Mr. DEBENHAM, said that on the 26th of April the defendants wrote to the Company enclosing a cheque for £2 6s. 3d. in full discharge of the water-rates due in respect of the premises in question. They returned the cheque, and informed them that unless the proper amount, £6 10s. 8d., was paid within seven days, proceedings would be taken to recover it. Though they admitted liability for a portion of the time, the defendants had not paid anything into Court.

Mr. *Henderson*, one of the Company's collectors, gave evidence as to making applications for payment of the amount in question. Defendants paid up to Michaelmas, 1900, but did not give any notice that they would not be responsible for anything after that date. In each case the premises were let as tenements. He had been to the premises, and in respect of one house, No. 175, Copenhagen Street, he had seen bills, with defendants' names attached, offering to let a portion of the house at a weekly rental. He knew defendants collected the rents; but beyond this he had no idea as to who was owner of the premises.

Replying to Mr. ROBINS, witness said the houses were assessed at £20, £40, and £44 respectively. He had no knowledge as to what the rents were.

Mr. ROBINS quoted section 72 of the Water-Works Clauses Act, 1847, which provided that the owners of all dwelling-houses occupied as separate premises, with an annual value not exceeding £10, should be liable (instead of the occupier) for the payment of the rates; but he said that in the present case the houses were assessed at considerably over £10, and therefore the owners were not responsible.

His HONOUR remarked that if a person, though not liable to pay under the statute, paid the rates, and recognized that he was the person to pay, and by so doing prevented the Water Company from rating and suing the occupier, he might be estopped by his own conduct from saying he was not liable until he gave notice to the Company. In other words, if a series of payments had been made, and afterwards the person who made them wished to avoid any further liability, he must give notice. It would be very unfair to the New River Company that defendants, after paying the rate, suddenly repudiated responsibility, without giving any opportunity to them to sue the tenants.

Mr. DEBENHAM: Under the Act, either the owner or the occupier may apply for the water to be laid on; but whoever makes the application is liable for the rate. In the case of an occupier of a house of less than £10 rental, though he can demand the supply, the owner is the person responsible for the water-rate; and he may be liable under either circumstance.

His HONOUR: But you must show that the owner has demanded the supply. Where a landlord has paid, he must continue to pay, unless he gives notice that he will not be further responsible.

Mr. ROBINS, in reply to the Judge, said he had stated his only defence.

His HONOUR said he must give judgment for the plaintiffs for the amount claimed, with costs.

MISCELLANEOUS NEWS.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

The accounts of the Edinburgh and Leith Gas Commissioners for the year ending the 15th of May have just been issued (subject to audit), accompanied by an abstract by the Treasurer, Mr. John S. Gibb. It contains the following statistics:—

The gross surplus on the year's working is		£70,686	10 7
There has been paid during the year—			
For Edinburgh and Leith annuities .	£32,335 10 3		
,, Edinburgh-Portobello gas annuities	1,122 8 0		
,, Amount transferred to sinking fund in respect of annuities redeemed .	1,742 1 9		
,, Do. in respect of mortgages redeemed	636 18 0		
,, Interest on mortgages, &c. . . .	22,777 8 2		
,, Expenses of mortgages	903 0 0		
		59,517	6 2
Showing a net balance against the year's income of .		£11,169	4 5
This being taken from the amount brought forward from 1900-1, after deducting contributions to sinking funds		6,410	3 0
Leaves the sum at the credit of profit and loss account .		£17,579	7 5
This is subject to the statutory minimum charges for the sinking funds as follows:—			
(1) For repayment of money borrowed (20s. per cent.)	£7,752 14 1		
(2) For redemption of annuities (15s. per cent.)	7,073 10 8		
		14,826	4 9

This being deducted from the above sum, leaves a balance of £2753 2 8 which may be dealt with at the discretion of the Commissioners in terms of their Act.

Mr. Gibb explains that the foregoing statements as to the sinking funds are made on the basis of charging the prescribed minimum percentage (20s.) on the whole mortgage debt, without exercising the right of suspending the contributions for the expenditure on the new works at Granton. Should the Commissioners resolve to avail themselves again of this suspension, a further sum of £3176 0s. 10d. would be added to the above £2753 2s. 8d.; giving a free balance of £5929 3s. 6d. He regards the result of the past year's working as satisfactory. The revenue from gas is larger than in 1900-1 by £10,309; and tar, with sulphate of ammonia, by £3700. These increases are lessened, however, by the heavy drop of £9700 in coke sales. Fortunately, there is the very substantial decrease of £24,200 in the cost of coal, oil, and other manufacturing charges, and of £4800 in rates and taxes. There is an increase, however, in the cost of distribution of £4000 for repairs and maintenance of pipes, &c. Owing to the necessarily larger amount borrowed, there is a considerable increase in the payment for interest. The result of the whole is, however, that whereas on May 15, 1901, there was a deficiency of £11,536 12s. 7d. on the year's working, there was at the corresponding date this year, a surplus of £11,169 4s. 5d.

The accounts show that the stock capital amounts to £351,210. Originally it was £370,000, but £18,789 16s. 2d. has been expended in redeeming annuities, which have been reduced from £35,200 to £33,425. The loan capital amounts to £796,041. The total amount authorized to be borrowed is £800,000, so that there only remains power to borrow £3959. Mortgages have been redeemed to the extent of £20,770. The capital outlays during the year amounted to £210,698 at Granton, raising the sum expended upon the new works to £498,296; £5430 was spent upon main and service pipes and cost of laying; and £3875 upon gas-meters.

The revenue account shows an income of £327,556, of which £291,164 was derived from the sale of gas (1,773,276,700 cubic feet), £11,714 from coke, £12,927 from tar and ammoniacal liquor, £11,061 from sulphate of ammonia (less working expenses), and £18 from waste lime. The expenditure amounted to £256,869. The manufacture of gas cost £203,727, of which sum £117,783 was for coal (166,014 tons), £15,161 for oil for carburetted water gas (3419 tons), £9766 for purifying materials, oil, water, and sundries, £50,870 for salaries and wages, and £10,145 for the repair and maintenance of works and plant. The distribution of gas cost £27,194, of which £11,691 was for salaries and wages, £6969 for repairs and maintenance and attendance at gasholders, £5581 for repairs and maintenance of meters, and £2953 for repairing and fitting up gas-stoves. Management cost £10,000; feu duties, £289; rates and taxes, £7352; pensions, £450; allowances to old employees, £327; grants to families of Army reservists, £221; law and parliamentary expenses, £573; accidental damages, £7 3s.; discounts, abatements, bad debts, £6727.

The sinking funds for the repayment of money borrowed and the redemption of annuities amount respectively to £8151 and £89,312.

The gas-stove account shows the value of stoves on hand, or lent on hire on May 15, 1901, to have been £17,391; the value of stoves purchased during the past year was £3708; and the expenses of repairing and fitting up stoves came to £3260—making a total of £24,359. There was received for the hire of stoves, £3007; for stoves sold, £860; for fitting up gas-pipes £307; and a deficiency on fittings charged to revenue account amounts to £2953. The value of stoves on hand or lent on hire is now £17,231.

Messrs. G. Pettigrew and Co., of Thornaby-on-Tees, have obtained contracts to erect complete their newest type of sulphate plant, at Londonderry, Treforest, and Weymouth Gas Works.

COVENTRY CORPORATION GAS SUPPLY.

The Disposal of the Profits.

At the Meeting of the Coventry City Council last Tuesday, the annual report of the Gas Committee, the principal figures in which were given in the "JOURNAL" last week (p. 43), was presented.

Mr. ROTHERHAM, the Chairman of the Gas Committee, in moving the adoption of the report, pointed out that in the twelve months under review they had made nearly 31 million cubic feet of gas more than in the previous year, and they had sold 34 million cubic feet more—an increase of 6½ per cent., which was very satisfactory indeed. While they had increased their manufacture, their sales had gone up to an even greater extent, owing to there being a slight decrease in the quantity of gas consumed upon the works, which showed that greater care had been exercised. While this had been so, there had been a still more satisfactory decrease in the gas unaccounted for, the percentage of which on the make had been reduced from 3·36 to 2·57. This was exceedingly low, and he thought they might congratulate themselves upon the fact. Another point of interest was the capital employed per 1000 cubic feet of gas, which last year was 8s. 8d., against 9s. in 1900-1. They carbonized about 1000 tons of coal less, and they produced 34 million cubic feet more gas. Having dealt in detail with the various items of revenue and expenditure, Mr. Rotherham said the total result of the working was an available profit of £2459—an increase of £2130 on the preceding year. The Council would possibly have been struck by the fact that while they had sold 34 million cubic feet more gas, and had carbonized 1000 tons of coal less, their prices being the same, that there was not a larger profit. The answer was divided into two sections, and the first was that the price of residuals had dropped enormously. The other part of the answer was the old, old trouble of the Gas Department—the question of coal. It was a curious thing, but absolutely correct, that their coal last year worked out at the average cost of 18s. 4d. per ton, against an average cost of 17s. 7¾d. in the previous twelve months. But there was another reason, and it was that at the end of last year their stock of coal was not taken at the contract price of 18s. 9¾d., as it should have been, but at 1s. 9d. more than that. The same mistake was made in March, 1901, and he was afraid it would militate to a slight extent against their success in the current year. How the extraordinary mistake had been made he did not know; but the figures showed that it was made. Passing from the general statistics of working, they came to the result—a profit of £2459. The Committee had decided to recommend the Council to place £2000 of this to the reserve fund; and this, he imagined, would be the question of interest to the Council. They had a turnover of about £90,000 a year, capital invested to the extent of £245,000, and at present a reserve fund of £5000. To his mind this was wrong. He thought the reserve fund should have been built up gradually to a large extent in the past. It should be the business of the Gas Department to do this now and in the future; and therefore the Committee made the recommendation they had done.

Alderman BOOTH seconded the motion.

Mr. AVISS remarked that, taking into consideration the kind of business with which the Committee dealt, the reserve fund was far too low. He did not wish to criticize the figures in the report, but would merely point out that the balance of £329 brought forward and the bank interest of £989 were not legitimately made "profit;" and if the Council took this into consideration, it only showed a profit of £1300. He thought it would be a wise business policy to agree with the recommendation of the Committee.

Mr. WEST said he could not follow the Chairman of the Committee and Mr. Aviss in suggesting that the whole of the £2000 should be placed to the reserve. He thought this should be increased; but he did not think it was the right policy to take the whole of the profits. It would be better, in his opinion, to take £1000, and an equal proportion of the profits next year, and so on, and thus build up the reserve fund. He moved an amendment to the effect that instead of £2000 being carried to the reserve, only £1000 should be taken for the purpose.

Dr. CALLAGHAN, in seconding the amendment, suggested that if the gas undertaking did not pay, the price of the illuminant should be increased. (Cries of "No, no.")

Mr. LEE supported the amendment. He said he was grievously disappointed with the report. Last year's was bad enough; but this one was worse. He was looking at it from the ratepayers' point of view. There were no profits in relief of the rates last year, and there were none now—in fact, it was three years since they had any. They were told that the gas-works were the one redeeming feature—the one thing upon which the ratepayers could always depend for help. Now, in a very ingenious manner, the Chairman of the Gas Committee had put these figures upon them: On a turnover of £90,000, the profit was only £2400! The thing was preposterous. Last year the gross profit was over £9500; this year it was £3,000. Last year the Chairman gave as excuses for such a disastrous balance-sheet the increased cost of coal, the renewal of mains, and the flood. He had no excuses this year, and had not attempted to make any. He (Mr. Lee) did not see that a reserve fund of £7000 was necessary at the present time, considering that they had borrowed money two years before they wanted it, and that the new works at Foleshill, from which they expected enormously increased trade, would not be in operation for two years. There was no return from the electric light, baths and parks, and sewage works; and if they lost the Gas Department, there would be no Corporation undertaking that paid its way, except the water-works. He wished the Council to take a serious view of the matter. They would probably want a 2d. rate next half year; and this £2000, or half of it, ought to go in support of the rates. He hoped the Council would pass the amendment.

Mr. ROTHERHAM, in reply, said he could not follow Mr. Lee's arguments. That gentleman said the ratepayers depended upon the surplus profit of the gas undertaking for help. They had Mr. Lee on one side,

and the Chairman of the Finance Committee, who heartily supported the recommendation, on the other. Mr. Lee urged that as the new works would not be in operation for two years, the reserve fund would not be required for that time. But it was just when the business was in the present transition stage that a reserve fund was needed—not when they were making profits. Dr. Callaghan had suggested that their duty was to increase the price of gas. This proposal was received, he thought, very distinctly by the Council. They did not want to raise the price of gas, but rather the other way. Surely the primary duty of a municipality who had a monopoly was to do away with the high price of gas, which previously paid dividends to shareholders, and allow the manufacturer to get his gas as cheaply as possible. This was the principle upon which the Committee worked, and it was one he thought the Council would approve. If they were going to tell the Committee to put only £1000 to the reserve, they were already going £1000 below what they had sanctioned themselves. They had to remove the sulphate plant for economy and safety, and they would leave £2000 behind them. He did not think he could give a better reason for having the reserve fund stronger and their finances more healthy during the transition period.

The amendment, on being put, was defeated by a large majority, and the report adopted.

LINCOLN CORPORATION GAS SUPPLY.

Decrease in Profits—The Value of Water Gas.

At the Meeting of the Lincoln City Council last Tuesday, Alderman Wallis made his annual statement in regard to the working of the gas undertaking. He said that in the year ending the 31st of March last the total income, in round figures, was £43,216; being a decrease of £4108 compared with the preceding twelve months. The returns from residuals were £9500, or £5702 less than before. This was a very large decrease, and it was found to be due to the drop of about 5s. a ton in the price of coke, which made a difference of £4576. Against this they had some little increase in income. They received for gas £33,076, against £31,589. They had made about 7 million cubic feet more gas than in the preceding year. The rents from cookers amounted to £639, against £538. The gross profit for the year was £6971—compared with £9302. Coming to the profit and loss account, repayment of loans accounted for £1880; interest, &c., absorbed £6107; and regenerative furnaces (which was really an item in the capital account), £965. These sums, coupled with the outlay on cookers and compensation for an accident paid to a workman, made up a total of £10,110, against a gross profit of £6971—a deficiency of £3139. The balance standing to the credit of the profit and loss account at the beginning of the year was £5079, and at the end it had been reduced to £1940. The reserve fund stood at £6315, of which £4479 was invested, and the balance of £1836 was in hand towards working capital. The total original loan debt was £194,417, and of this £31,000 odd had been paid off by the operation of the sinking fund. As far as the working results for the year were concerned, the Committee had saved in nearly every case, so that the decreased profit was not owing to any less satisfactory working results or want of efficiency. New mains had been laid to the extent of 1 mile 1092 yards, and 328 new consumers had been added. For the current year, if the Committee could see no way of increasing the income or reducing the expenditure, they would have been compelled to raise the price of gas—a course which he recommended when coal went up. But they hoped to save £2500 on coal; the £965 which had been spent on the regenerative furnaces would not recur; and on cookers it was thought the expenditure would be £200 or £300 below the £700 for the year just ended. These two last items alone accounted for some £1200 or £1300, and there was expected to be a saving of about £300 in oil. They were hoping during the year to make a profit running into five figures. They were calculating that instead of having a balance against them of £2000 or £3000, they would have one of £1000 or £1500 on the right side. He had only to add that they were not using so much water gas as they might do.

In the course of the discussion following Alderman Wallis's statement, the Mayor (Mr. J. W. Ruddock), referring to the water gas plant, said he sometimes doubted whether the citizens had benefited by it; and Mr. Mills asked if this gas was as good for the consumer commercially as coal gas. Alderman Wallis said he would leave the Gas Manager (Mr. John Carter) to answer Mr. Mills. As between coal and water gas, they would have had to spend at least £30,000 to have made the plant sufficient to supply all coal gas; while for £13,000 or £14,000 they had a very excellent plant for making water gas, with which they had no reason whatever to be disappointed. On the contrary, they ought to congratulate themselves on having put in the plant. They were only using a small proportion of water gas. In answer to Alderman Wyatt, Alderman Wallis added that the financial result was satisfactory. The Corporation were getting a corresponding advantage by the adoption of the plant. Mr. Carter, replying to Mr. Mills, said the commercial value of carburetted water gas was determined by the amount of light the consumer got out of it. In burning 5 cubic feet of water gas, assuming he had all water gas, the consumer would get a light of 18 candles, against 16½ or 17½ with coal gas. Considerable prejudice had been aroused in some quarters against the use of water gas. The total quantity of gas they made in Lincoln during the year was 324 million cubic feet—of which only 41 million cubic feet were water gas, leaving 283 millions for coal gas; so that nobody could charge the Corporation with having exceeded the undertaking given to use the water gas to a limited extent. The main objection in certain quarters had been the use of water gas for power; and they could easily understand that every little matter that went wrong had been charged against the gas. This was the case constantly during three months when no water gas whatever was being supplied. With regard to the commercial value of water gas, if used alone for power, and also with regard to its calorific value, it was 5 per cent. below coal gas—assuming it was neat water gas. Seeing, however, that they never exceeded 30 per cent. of water gas, the proportionate difference was not more than 2 per cent. With regard to Alderman Wyatt's question, the obvious reply was that during the last twelve months there were two factors which made for dear coal gas on the one hand, and cheap water gas on the other. In the first place, coal had been dear and coke cheap; in the second, both oil and coke had been cheap, and this made for cheap water gas. During the past year, 18½ candle water gas had been made, at the manufacturing cost of 3d. per 1000 cubic feet less than it was possible to make 17-candle coal gas. The minutes of the Committee, containing the particulars forming the basis of Alderman's Wallis's statement, were then adopted.

WEST BROMWICH CORPORATION GAS SUPPLY.

The Diminished Profits.

At the Meeting of the West Bromwich Town Council last Wednesday, Mr. E. Wilson, in moving the adoption of the annual report and accounts of the Gas Department, noticed in the "JOURNAL" for the 17th ult. (p. 1698), explained that during the past financial year the Committee had been working under very disadvantageous circumstances, and in consequence their surplus was only £234, against £4513 before. They ought, however, to regard the undertaking not solely from a corporate, but from a business standpoint. If they did this, they would find that the Committee had provided for extensions and stock something like £3623, and for interest £5150; while with the surplus the concern would have made a profit of £9007 to be dealt with, either for depreciation or by way of dividend. He did not say that £9000 was a sufficient profit for a large concern like the gas works to have made; but when they considered the adverse circumstances under which they had been working, the exorbitant price of coal, and the low return obtained for residual products, it would be patent to the Council that no other result could very well be anticipated. Coals had cost 1s. 1d. per ton more than in the previous year; and this, he thought, would be found to be 7s. per ton above the lowest price paid some two years ago. This the Council would at once see had been a great source of anxiety to the Committee in carrying on the work from year to year; and it would also make a difference of something like £1600 on the credit side of the balance-sheet. All the items on the debit side showed a decrease, which indicated very clearly the great care that had been exercised in the management of the concern. There was an increase in the cost of purification; but this was absolutely necessary. In connection with the sale of residual products, £4812 16s. less than in the previous year had been realized; while for tar they had received £539 less, and for ammoniacal liquor £108 less. These items put together would more than make up for the deficiency that appeared between the two years. The increase in the consumption of gas had not been quite so large as it was some time ago—being only 2·85 per cent.; but he did not think the electricity undertaking had seriously affected the business of the Gas Department. Referring to the consumption of gas for industrial purposes, he said he believed it would be to the advantage of the Committee and the Council to reduce the price of gas for manufacturing operations. The revenue had been considerably affected by the decision to reduce the price of gas for public lighting purposes this year, which would make a difference of something like £1000 in the revenue. With a profit of £234, and a decreased income of £1000, they would be landed next year in a loss of £750, unless they could make it up in another direction. They found that coal was now cheaper, and they had completed some of their contracts; and they hoped in the coming year to save more than the £1000 they would lose. After a few remarks, the accounts were approved.

GAS SUPPLY IN THE MIDLANDS.

Stoke-upon-Trent.

The satisfactory completion of the extensions and alterations at the gas-works of the Stoke Corporation, which have been carried out under the supervision of the Engineer and Manager (Mr. W. Prince), was referred to at the last meeting of the Town Council, when a resolution was proposed by Mr. Massey congratulating the Chairman of the Gas Committee (Alderman Geen) thereon. He said the total outlay had been £28,954 18s. 9d.; and the works were now equal in every respect to absolutely new ones. The estimated cost of new works was about £60,000; so that by the renovations they had saved a considerable sum. The Committee ten years ago took over from their predecessors a patent by which they lost £2335. The extensions had been a source of anxiety to Alderman Geen; and he thought there ought to be some official recognition by the Council of the labour and attention which that gentleman had devoted to them. One remarkable fact was that, during the alterations, the works were carried on successfully; the amount handed over to the rates being something like £25,432. The income ten years ago was £14,758; to-day it was £22,365; while the gas produced had risen from 99,054,000 cubic feet to 130,974,000 cubic feet. Mr. Massey also spoke eulogistically of the work of Mr. Prince. The Mayor (Mr. T. R. Yoxall) supported the motion. He said that ten years ago he came on the Council with the object of fighting Alderman Geen on the gas question. He did fight him, and was glad he had lost. He soon became convinced that he was in the wrong and Alderman Geen in the right. The motion was carried with applause. Alderman Geen, in returning thanks, referred to the kindness and assistance he had received from his colleagues. He took the resolution as a compliment to the whole of the members of the Gas Committee. He also acknowledged the splendid work

done by Mr. Prince. Referring to the cost of the alterations, he said it had all been paid with the exception of £10,000. The augmented income was due in a great measure to the higher price of gas; but when Mr. Massey spoke of the increase in the quantity of gas produced, he was on right lines. Alderman Geen concluded by remarking that the Stoke Gas-Works were second to none in the district.

Fenton.

The Chairman of the Gas Committee of the Fenton Urban District Council (Mr. J. Shenton) made a statement, at the last meeting of that body, in reference to the position of the gas-works. He remarked that the year before last the works yielded a profit of £2086 11s., which was disposed of by placing £250 to a sinking fund, £200 to a reserve fund, and £560 to the relief of the rates, £400 was reserved to re-arrange and improve the lighting of the main thoroughfares, £300 went to the extension of offices, and £376 11s. was utilized for repair and maintenance. He claimed that the Gas Department had carried out their undertaking in these matters; indeed, as a matter of fact, they had actually done more than they bargained for. As well as completing a good block of offices, they had furnished and thoroughly equipped them out of the money allotted. Not only had they improved the public lighting of the thoroughfare from Longton to Stoke, as they undertook to do, but they had also, with the assistance of Mr. Hopwood, the Chairman of the Highways Committee, extended their operations to other streets. Though they were unable on this occasion to report so large a profit as before, yet, taking everything into consideration, the results were quite satisfactory. There was a decrease of 2,989,000 cubic feet in the quantity of gas made, and of 3,963,900 cubic feet in the amount distributed to ordinary consumers. To prepayment consumers, however, there was an increase of 1,143,000 cubic feet. The unaccounted-for gas amounted to a little over 9 per cent. of the quantity manufactured, which, being a decrease of 1 per cent. compared with the previous year, was very satisfactory. During the year, 214 new consumers had been secured, and 177 cookers fixed; 1308 yards of new mains had been laid down, 703 yards relaid, and 367 new services put in, the whole of which had been paid for out of revenue. The total expenditure was £10,002 18s. 4d.—a decrease of £927 3s. 7d. As a whole, the position of the undertaking was summarized as follows: Income, £14,691; expenditure, £10,002. Deducting £376 brought forward from last year, there was a gross profit of £4311. After charging interest and the instalment of principal, the net profit was £1357 18s. 6d. Mr. Shenton pointed out that there was an increase in the value of their assets of something like £1000, and therefore he might claim, he thought, that the year's work had been eminently satisfactory.

GAS AFFAIRS AT SALFORD.

At the Monthly Meeting of the Salford Borough Council last Wednesday, the Gas Committee reported that for the twelve months ending March 31 there was an increase in the output of gas of 2·91 per cent. over the previous year. The coal and cannel carbonized amounted to 152,894 tons, and the quantity of gas made was 1,595,198,000 cubic feet, of an average illuminating power of 19·70 candles; the parliamentary standard being 18 candles within the borough and 17 candles as tested in the out-districts. There had been a slight decrease in the cost of coal, but not sufficient to warrant any reduction in the price of gas. The works and plant had been maintained in a thoroughly efficient condition; and new trunk mains had been laid to improve the supply of gas to the Broughton and Eccles districts. The business in prepayment meters continued satisfactory; but the demand for cooking stoves had been smaller, owing no doubt to the increase in the price of gas. The more favourable terms obtained in purchasing coal for the coming year had enabled the Committee to recommend a reduction in the price of gas in the future. Mr. Francis Jones, the Official Chemist, had reported that the average illuminating power at the Bloom Street works was slightly higher, and at the Regent Road works considerably higher, than the averages of last year. At the Bloom Street works, the average illuminating power was equal to 19·56 standard candles; and at the Regent Road works to 19·84 candles. Alderman Snape drew attention to complaints which had been made in the newspapers by consumers with regard to their gas bills. He asked whether nothing could be done or said to allay the fears which seemed to exist in some quarters; and he suggested the advisability of appointing an expert to go into the question as to the accuracy of the gas-meters. Alderman Mandley wanted to know whether the index of a meter was reliable. Alderman Phillips (the Chairman of the Gas Committee), in reply, said there was no ground whatever for supposing that the indices were faulty. There was one danger—that of putting in a wheel of the wrong size; but in Salford this had been guarded against. People who grumbled because their gas bills were larger in a certain quarter than they were in the corresponding quarter of the previous year, seemed to leave the climatic conditions out of consideration altogether. The proceedings of the Committee were approved.

ELECTRICITY v. GAS AT COLCHESTER.

At the Monthly Meeting of the Colchester Town Council last Wednesday—the Mayor (Alderman W. Marriage) presiding)—the Lighting Committee presented a special report relative to improving the lighting of the principal streets. In the course of it, they stated that, in the face of the adverse comments and criticisms relative to the present public lighting, the time had now arrived when they should place before the Council a scheme for effecting a material improvement; and they unanimously recommended that 150 Nernst electric lamps should be substituted for 150 gas-lamps in the principal streets of the borough. The Committee's proposals involved an increased annual expenditure of £169; but they emphasized the fact that this would ensure an illuminating power four times greater than at present. There would also be an initial capital outlay of £450. They recommended that the latter amount be apportioned over the four financial half years commencing in September next, and that they be authorized to carry out the proposed scheme. The Committee added that they considered the scheme the most satisfactory and economical one that could be devised. To improve the existing gas lighting, it would be necessary to more than double the number of lamp-columns; and the capital expenditure involved in so doing would exceed the capital outlay in connection with the Nernst lamps, while the cost of lighting an additional 150 gas lamps would entail an increased annual expenditure of at least £400. This they were not prepared to recommend, for the important reason that the total candle power would then be only 6000, as against the 12,000 candle power which would be furnished by the Nernst lamps.

Mr. Thompson Smith moved that the report be approved, except the portion referring to the substitution of 150 electric lamps for the same number of existing gas lamps. He did not think the Nernst lamp had been known in England for more than four months; and the Committee had not had sufficient time to test the efficiency of the lamps so as to enable them with confidence to recommend an expenditure of £450 in substituting them for gas-lamps.

Mr. E. S. Beard seconded.

Mr. Moore considered the financial position of the Council was not such as to justify an expenditure of £800 for experiments in the improvement of the public lighting.

Mr. Nash, in supporting the Committee's recommendation, said the Nernst lamp had been known for four years.

Mr. Benham averred that at the present time Colchester compared very well, even with towns lighted by electricity; and it was, he said, a serious thing to add £370 at least to their annual expenditure. It would no doubt benefit the electric light undertaking, in which all the ratepayers were shareholders; but it had never been intended to bolster up the concern in this way.

Alderman Sanders indignantly denied that the Electric Light Committee had thought of "bolstering up" a municipal undertaking in order to make it pay. For six or seven years the older streets of the town had been disgracefully lighted; and the Committee brought the report forward because they believed they were doing it in the interests of the public. They were not so mad as to dream of asking the Council to spend money on a lamp which had only been before the public for four months. The makers had given the lamp a three years' test before putting it on the market; and he (the speaker) could give the Council a list of towns in Germany where for two years it had given entire satisfaction, and had supplanted gas. Moreover, it had been used in the streets of London for twelve months, and had given universal satisfaction. The Committee were absolutely certain that the Nernst lamp would be most economical.

The amendment was lost, as also was a proposal to cut down the scheme; and the report of the Committee was then approved.

ELECTRIC LIGHTING NOTES.

The Position of the West Bromwich Undertaking.

A long discussion took place at the meeting of the West Bromwich Town Council last Wednesday, with regard to the annual accounts of the electricity undertaking, and Alderman Pitt mentioned that the deficit for the year was £1403, compared with £1486 as estimated by the Committee. They commenced with but 17 customers, but now they had 94, which he thought was satisfactory evidence of the progress the undertaking was making. He believed that in eighteen months or two years the income would meet all kinds of expenditure. Mr. Bushell, on the other hand, regarded the prospects of the undertaking as anything but rosy. The report submitted to the Council meant that in supplying 94 customers the Committee had lost £14 18s. 7¾d. per consumer in order to obtain their custom. He could not imagine that the Council would pass such a report without a strong protest against the continuance of municipal trading on these lines. He moved an amendment to the effect that, in view of the serious loss sustained by the electricity undertaking, owing to the exceptionally low charges made for the current, the future prices be raised to a point which would approximately be sufficient to cover the estimated total cost to the Corporation. Mr. Newman seconded the amendment. Ultimately, on the understanding that the matter would receive the attention of the Electric Lighting Committee, Mr. Bushell withdrew his amendment.

An Electric Light Scheme for Faversham.

Out of the population of rather more than 11,000 which Faversham possesses, 135 people have promised to take a supply of electric current if the Corporation will provide it; and on the strength of this great demand, added to the 3000 public lamps, the Town Council are taking steps to carry out a scheme which has been prepared for them, and which looks very well on paper. The Ratepayers' Association had a meeting a short time ago, and listened to an elaborate discourse by the Mayor (Mr. F. Austin), who is evidently an enthusiastic admirer of a light which he told his auditory always "knocked out the gas wherever it was introduced," as it could not enter into competition with it. The Corporation have asked for permission to borrow £24,190, though the Mayor was careful to point out that they did not intend to spend the whole of it "right away." This is just as well, as the interest and sinking fund would make a considerable hole in the profits—supposing there should be any, because a few of those present had the hardihood to suggest a possible deficit. One speaker pointed out that if 150 houses were supplied, and each had, on an average, 15 or 16 lamps, they would have some 2000, which would bring in £800 or £900, while the public lighting would produce £450; so that the total income would be about £1500 for the first year. The

Mayor assured this doubter that the Engineer had put the receipts at the very lowest point, and in all probability they would work out to the advantage of the Council. The meeting were evidently determined to have the electric light, for a resolution to support the Council in their application was carried with only five dissentients. It is to be hoped they may not repent of their decision. The electric light may have "knocked out the gas" in a number of provincial towns; but, judging by the analysis of the accounts of the supplying local authorities given in the "Electrical Times," the financial results of the operation have not been very brilliant, for, after providing for interest, depreciation, and sinking fund, deficits are shown in 49 places out of a total of 91. Fareham, which was quoted by the Mayor as an example of a "successful" electric lighting installation by a local authority, is the one town in the list in which neither a profit nor a deficit is shown for the year ending March, 1901. The gross profit was £767, of which £480 went for depreciation and to the sinking fund, and £287 for interest on loans. Another speaker, a shareholder in the Gas Company, expressed the opinion that the ratepayers should have some guarantee that "when there was a profit it should go to the reduction of the rates." The Chairman (Mr. J. Kettley) said he thought the electric light was the very thing that would help them!

Increased Revenue but no Profit at Brighton.

At the meeting of the Brighton Town Council on Monday last week, the Lighting Committee reported that they had had under consideration the statement of accounts for the year ending the 31st of March. It appeared therefrom that the net revenue account in connection with the electric light undertaking showed charges amounting to £24,445, against which there was on the credit side a sum of £24,277; leaving a deficit of £168, which was transferred to the reserve fund. In the preceding year, there was a balance of £107 carried forward. The statement of electricity generated, sold, &c., showed a total of 5,685,435 units generated, 4,860,430 units sold, and 360,066 units used on works; the total quantity accounted for being 5,220,496 units—leaving 464,939 units unaccounted for. Of the current sold, 809,350 units were assigned to the public lamps and 264,693 units to the tramways; while 3,786,387 units went to private consumers by meter. Mr. Holloway, in moving the adoption of the accounts, pointed out that the loans sanctioned amounted to £824,893, of which £414,531 had been taken up—practically half the amount. For private electricity sales, there had been received £50,254, compared with £41,690 before; and they anticipated that the increase next year would be at the same rate. No profit had been made on the electricity used for the tramways, as they had supplied that Committee at about cost price. Supposing the undertaking had been the property of a Company, the profit made would have been £24,277, or equal to about 5¾ per cent.; but being a municipal undertaking, the sinking fund and interest absorbed rather more than the whole of the revenue. They had supplied, as municipal undertakings were expected to do, the consumer at the lowest possibly cost—indeed, they had supplied him at, unfortunately, a fraction under cost. Three years ago they reduced the price of electricity from 1½d. to 1d. per unit, which they had no right to do; and the Committee of that day had acknowledged that they were wrong. If they had retained the price at 1½d., they would have taken last year £5000 more from the private consumers and £1500 more for street lighting, and this would have increased their reserve. At the close of the year 1900-1, they had a reserve fund of about £5000; but he then pointed out that extraordinary expenditure would have to be incurred during the past year. The only thing which troubled him was the reserve, as it was ridiculous for an undertaking employing upwards of £400,000 to have a balance of only £3420. In the case of an accident at the works, he did not know what they would do; they would have to come upon the rates. He was not proposing to raise the price of the current; but if they went on at the present rate they must not expect any profit next year. In the course of the discussion, Mr. Carden congratulated the Council upon the satisfactory balance-sheet which had been submitted. He said the results were immensely superior to those achieved by most municipalities during the past year. He had a list of 56 towns which showed a loss on the electricity undertaking. At Bristol, for instance, they only paid 14s. a ton for coal, as compared with 24s. a ton at Brighton, and yet Brighton finished the year practically square, while Bristol lost £2000. Again, Brighton was paying off its capital at a much higher rate than other towns. Almost every town in England would be glad to have such results as Brighton had; they were extremely satisfactory. The accounts were passed.

LONDON COUNTY COUNCIL AND THE WATER QUESTION.

At the Meeting of the London County Council last Tuesday, the Chairman of the Parliamentary Committee (Mr. G. H. Radford) formally brought before the Council the report on the London Water Bill given in the "JOURNAL" last week. He remarked that as the Bill emerged from the Committee, they found that the process of indirect election to the proposed Water Board was increased rather than diminished, as they had hoped would be the case; and its parochial character remained very much what it was. The Council had now to consider what they could do to avert the mischief threatened to London by the passing of the Bill in its present form; and it was certainly the duty of every member to do his utmost to put an end to this infamous measure. Mr. Dickinson said the matter should have gone through the ordinary process of independent inquiry in each House; and if this had been done, he thought that the Council's contentions would have prevailed. He could not believe that the proposed Board would succeed, as it was not properly formed or devised to be a working machine. Mr. Beachcroft thought it would be best for the Council to accept the scheme, and not set their back against the wall. Mr. Campbell thought that if anybody should have a predominant voice in the proposed Board it should be the County Council; and they should not be swamped by the Borough Councils. Changed in this respect, he believed the Bill would be a workable one. Lieut.-Col. Probyn defended the principle of the representation of the Borough Councils on the Board. Mr. Fletcher said most of them wished the Board had been smaller; but there was no reason to suppose that it would be composed, as had been asserted, of stupid and incompetent people. It would be better for them to accept what was now proposed. Mr. M'Kinnon Wood (Chairman of the Water Committee) said that for any real or solid defence of the proposed Board they looked in vain, and they would still do so in any assembly of sensible men. The Water Bill stood merely by the fiat of one particular Minister. It was disapproved of by many Conservative members; and if it was carried, it would only be because it was a Government measure. The scheme would not carry out the objects of the municipalization of the water service, and was one against which London was entitled to protest with all the emphasis in its power. The report was then formally received.

LIVERPOOL CORPORATION WATER SUPPLY.

Water Engineer's Annual Report.

The Water Engineer of the Liverpool Corporation (Mr. Joseph Parry, M.Inst.C.E.) has presented his annual report to the Water Committee. It embraces the twelve months ending Dec. 31, 1901; and it is followed by a valuable report by the City Analyst, Professor J. Campbell Brown, on "Deposits in Pipes Conveying Vyrnwy Water before Filtration," and a reprint of a paper by Professor Boyce, F.R.S., on "Fungus Deposits in Unfiltered Water-Mains."

Taking Mr. Parry's report first, he points out that, notwithstanding the deficient rainfall last year, a full constant service was maintained throughout the large area supplied from the Liverpool works; while during the summer a temporary supply from the Vyrnwy Aqueduct was given to the town of Oswestry, which was one of the places that suffered from the extreme drought. It appears that measurements of the rainfall on the Rivington watershed have been taken for the last 55 years, and only twice in this period has the quantity of rain fallen below that of 1901. At the oldest rainfall station, the amount measured last year was 38·13 inches, against 30·97 inches in 1887 and 37·10 inches in 1865. The total quantity of water delivered from the works of the Corporation, including compensation waters to rivers in Lancashire and Montgomeryshire, was as follows: In gallons, 17,151,469,000; in cubic feet, 2,748,633,000; in tons, 76,566,000. Mr. Parry gives in a table particulars of the total quantities of water supplied for different purp ses, and the average daily supplies compared with the year 1900. The following figures are taken therefrom:—

—	Average Per Day.	Total for Year 1901.	Total for Year 1900.
	Gallons.	Gallons.	Gallons.
Trade (by meter)	6,393,000	2,327,279,000	2,306,959,000
Ships ,,	451,000	164,249,000	142,642,000
Workhouses, &c. (by meter)	492,000	178,804,000	170,439,000
Miscellaneous (estimated)	1,535,000	558,792,000	551,000,000
Public purposes	1,704,000	620,271,000	621,335,000
Fire extinction	17,000	6,090,000	5,863,000
Domestic purposes	15,168,000	5,521,185,000	5,466,490,000
Salt Water	326,000	118,542,000	108,203,000
Water for condensing	139,000	50,741,000	49,647,000
	26,225,000	9,545,953,000	9,422,578,000
Outside supplies—			
Chorley	517,000	188,222,000	170,822,000
Towns and districts supplied in bulk	1,444,000	525,836,000	484,755,000
Total	28,186,000	10,260,011,000	10,078,155,000

The increase of population during the year in the Liverpool (compulsory) water area was 11,728, and the total increase in the quantity of water distributed in the same area was 123,375,000 gallons. The increase in the sale of water by meter for trade purposes was 50,292,000 gallons; but the total rate per head (31·176 gallons) was slightly lower than in the preceding year, so that there was a small reduction in the quantity of water wasted. The water distributed and sold in bulk was obtained from the several sources of supply in the following proportions: From Vyrnwy, 45·58 per cent.; from Rivington, 41·15 per cent.; and from wells, 13·27 per cent. On twelve occasions last year the supply from Rivington had to be shut off to repair breakages and defects caused by coal workings. There were also 127 leakages from bad joints, which were repaired without interrupting the flow through the aqueduct. The usual quarterly analyses were made last year by Professor Campbell Brown; and daily bacteriological examinations were carried out by Professor Boyce. A sample was taken once every month from each source of supply; and the average number of bacteria per cubic centimetre was as follows: Vyrnwy water (from end of aqueduct, Prescot reservoir), 12; Rivington water, 18; Dudlow Lane well, 25; Green Lane wells, 63; and Windsor well, 56.

After making some remarks on the condition of the wells, pumping-stations, and works, Mr. Parry passes on to consider the subject of the obstructions which have taken place in the pipes conveying the unfiltered water between Lake Vyrnwy and Oswestry. In a printed report dated Jan. 10, 1899, Mr. Parry gave a short narrative of the experiences and proceedings in connection with the reduced discharge of water through this length of the aqueduct, compared with the longer length between Oswestry and Prescot. At the date of that report, experimental plant was being erected at Hirnant, upon the recommendation of Professor Campbell Brown, in order to determine, on a larger scale than was practicable in a laboratory, the effect of adding a small quantity of lime to the water, with a view to reducing the action

on iron, removing the food which nourishes iron bacteria, and preventing action on lead. The plant, as originally laid down, consisted of a lime-water cylinder and mixer, as used in the first stage of processes for softening hard water, and it was placed close to the outlet well of the Hirnant Tunnel. A cast-iron pipe laid from that well conveyed the untreated Vyrnwy water to the mixer, and a small branch carried a separate supply to the lime cylinder. To this cylinder slaked lime was supplied in sufficient quantity to make the mixed water, after settling, neutral, or nearly so, as tested by litmus. The method of application was made as simple as possible, so that the apparatus could be managed by the walksman of the section, and the efficiency of the working was occasionally tested by visits of Professor Campbell Brown and Mr. Parry, and by samples sent to the Chemical Laboratory in Liverpool. From the mixer the water was delivered into a line of eight 9-feet lengths of cast-iron pipes, 4 inches in diameter. Three of these pipes were uncoated, two of them were coated by the ordinary Angus Smith process, and two were double coated—*i.e.*, twice dipped by the same process. At the side of, and parallel with, this line of pipes, a second line was laid, exactly similar in all respects, excepting that the water flowing through was untreated. This plant was put into operation on Feb. 25, 1899.

On the 23rd of September following, and after the plant had been in full working order for more than six months, the pipes were taken up for examination. Both lines contained thin deposits of the slime observed in the larger pipes, but the difference in quantity between the two was not appreciable. It was decided to increase the proportion of lime, so as to make the water quite neutral, or very faintly alkaline, and to erect small sand-filters on each of the two lines of pipes. The filters were put into operation on the 17th of November, and Mr. Parry also added on the untreated line of pipes a fine copper gauze screen placed near to the inlet. On April 19, 1900, Professor Campbell Brown and Mr. Parry again visited Hirnant, and took out for examination the pipes between the lime-mixer and the filter, and between the screen and the filter. They found in the short length of pipe between the outlet well and the lime cylinder and screen respectively abundant evidence of the slimy deposits that had given trouble in the larger pipes. After lime treatment, the pipes were substantially free from slime before filtration and absolutely free after filtration. On the untreated side, there was slime between the screen and the filter; but on the outlet side of the filter the pipes were as free from deposit as on the lime-treated side.

It was decided to continue the experiments through the summer, in order to see the effect of a higher temperature. The next completed examination was made on Sept. 24, 1900, when all the pipes were taken up for inspection. In the lengths between the lime cylinder and the filters, the two investigators found both lines free from black, slimy deposits; but in the untreated line, there was red slime and jelly-like growth occasionally to be found. After filtration, the pipes on both sides showed neither slime nor deposit. They decided to discontinue the lime treatment, but to continue the experiment with the filters. Up to this time, the filters had been composed of sand obtained from the river bed in the neighbourhood, and screened through a ¼-inch mesh sieve. The filters were subsequently re-made with artificially crushed sand from Silurian rock, and various degrees of coarseness were used in order to determine the maximum rate of filtration at which the desired result could be obtained. Mr. Parry also made several alterations in the mesh and construction of the screen, so as to determine the best form and arrangement of gauze.

In addition to the examinations made by Professor Campbell Brown, numerous visits were made by Professor Boyce to the lake and aqueduct, and samples of the water and deposit were taken for bacteriological and microscopical examination. At an early period of his water examinations, Professor Boyce had used a centrifuge for the purpose of collecting suspended matters. With this instrument, samples of the water under examination are put into strong glass tubes tapered at the bottom and placed on trunnions, so as to swing freely near to the periphery. The diameter of the centrifuge is 18 inches, and it is made to revolve by an electric-motor at a rate of from 2000 to 3000 revolutions per minute. The construction of the glass tubes was subsequently improved by the provision of a narrow stem with a graduated scale; and in this form the instrument proved to be very useful for measuring the relative amounts of suspended matters at different stages of the experiments at Hirnant.

The first measured determinations by the centrifuge were obtained at the beginning of last year, and the following figures show the value and interest of these observations:—

Description.	Samples Taken Feb. 8, 1901.	Samples Taken Feb 25, 1901.
	Deposit in Centrifuge.	Deposit in Centrifuge.
Vyrnwy water before filtration.	39 parts in 2750 c.c.	28 parts in 2740 c.c.
Do. after passing through experimental filter No. 1 . .	6 ,, 2750 ,,	4 ,, 2740 ,,
Do. after passing through fine screen (not filtered) . . .	9 ,, 2750 ,,	12 ,, 2740 ,,
Do. after passing through screen and through filter No. 2 . .	3 ,, 2750 ,,	13 ,, 2740 ,,

The conclusions arrived at by Professor Boyce were that the black deposit coating the pipes was composed of amorphous matter of a spongy, gelatinous nature, and was not a growth of a special organism, but was formed by the particles in suspension in the unfiltered water gradually settling out, just as they would do in the river bed. This conclusion was confirmed by the fact that the same deposit was found in Lake Vyrnwy, on the copper gauze screen at the filtering tower, and in the unfiltered reservoir at Oswestry. In the filtered water, however, the deposit was very greatly reduced. On Dec. 10, 1901, Mr. Parry reported to the Water Committee that he had received Professor Campbell Brown's report upon the organisms and deposits, and a print of it, in which the results of his investigations are fully described, is appended to the Engineer's report.

Mr. Parry comes to the conclusion, from the chemical and bacteriological reports he has received, that no deposits or growths of any kind have been found in the pipes conveying the filtered water from Oswestry to Liverpool. He therefore thinks this fact at once suggests the remedy for the difficulty experienced between Hirnant and Oswestry, and shows the importance of placing the filter-beds as near as possible to the source of supply, as in the case of Rivington, where the water is filtered before it enters the aqueduct. Filter-beds capable of dealing with 16 million gallons per day have already been provided at Oswestry, 18 miles from Lake Vyrnwy, and sufficient land has been acquired to construct beds for the whole of the 40 million gallons per day to be ultimately derived from that source. He does not think it necessary to recommend any chemical treatment, and is satisfied that, by a well-devised scheme of combined screening and filtering, the water can be delivered into the aqueduct in a condition that will greatly diminish, if not entirely prevent, the accumulation of deposits and growths that have hitherto retarded the flow. Recent improvements have enabled brushing operations to be carried on more speedily than was at first possible. The accumulations of deposits and growths can now be effectually swept out for the entire length of 15½ miles in about ten days. If the conditions at Rivington are favourable, and the Prescot and Oswestry reservoirs full at the start, this may be accomplished in two stoppages of five days each of the ordinary delivery from Vyrnwy to Oswestry; but if the conditions are not altogether favourable, longer intervals must be allowed to elapse between the several stages, and consequently longer time occupied. It would appear from recent observations that, as has been anticipated, the nodular incrustations, which the brush is not intended to remove, are becoming larger and more numerous, and will in course of time permanently reduce the rate of delivery through the pipes, except so far as it may be found practicable to remove the incrustations by scraping.

The report closes with the following statement of the capital expenditure on the undertaking up to Dec. 31, 1901: Harrington and Bootle Companies' works, £578,684; Green Lane works, £71,056; extensions of home works (wells, service reservoirs, and mains), £857,489; Rivington works, £1,329,343; Chorley works, £30,667; and Vyrnwy works, £2,227,466—total, £5,094,705. The gross ordinary revenue (including Chorley) for the past year was £298,752 13s. 6d.

CATON WATER-WORKS PURCHASE ARBITRATION.

Saturday, June 14.

(*Before Mr* R. E. MIDDLETON, *Arbitrator.*)

This was an arbitration, held at the Surveyors' Institute, to determine the price to be paid by the Lunesdale District Council for the undertaking of the Caton Water-Works Company.

Mr. SANDERSON appeared for the Company; and Mr. MELLOR represented the Council.

Mr. SANDERSON, in opening the case for the Company, explained that in 1901 the Council made an offer which the Company said was nothing like the sum they would be prepared to accept; and their Solicitor wrote to that effect, and made a counter-offer to sell for £12,400. After this, there was some little further correspondence in reference to the proposed bargain; but ultimately there was no agreement, and appeal had to be made to the Arbitrator to settle the price which should be paid. The Arbitrator would remember that the undertakers were not being required merely to dispose of a given article. First, there were their rights and powers, under their Order, to obtain and sell water. This was a very important asset in a case where the population had been steadily, if not rapidly, increasing, and in which there was every prospect of maintaining the increase. It seemed to him that this consideration should operate in fixing the market value. But, apart from the powers and rights, there were the items of land, buildings, plant, works, and general effects of the undertaking. The vendors would be able to prove that the works were in a good condition, the reservoirs and filter-beds well kept, and the conduit-pipes as good as new. The concern would meet the needs of a very much larger population than that for which it now catered. The watershed could, in fact, supply from 30,000 to 40,000 people. Sketching the history of the undertaking, he said as far back as 1875 the Sanitary Committee of the district were approached by the Vestry as to the nature and insufficiency of the water supply; and various steps were taken up to June, 1881, when the Sanitary Committee decided there was no necessity for an independent supply. Apparently the Local Government Board did not agree, for they wrote asking if the Rural Sanitary Authority proposed taking any steps. The Rural Sanitary Authority evidently did not agree with the Sanitary Committee either, for in December they decided to circulate a report prepared for them by Mr. Walker, which showed serious and even alarming facts with regard to the supply, which, at that time, was drawn from a highly polluted mill-race. In 1882, the Caton Sanitary Authority proposed to improve the supply, at an estimated cost of £600; but a public analyst's report on the mill-race water did not bear out the bad character the supply had received, and the scheme fell through. In the following year further steps were initiated. A meeting was called, and the result was the appointment of a Committee and a definite proposal to start a water scheme. It was computed that a charge of 3d. per cottage per week, and 10d. to 1s. in the pound on the rateable value of property of £15 annual value and upwards, would yield enough to pay the interest on the necessary capital; and the Parochial Committee called in a Mr. Veevers to get a practical opinion on the feasibility of the scheme—the plan being to make water-works just above the site of the present reservoir. Mr. Veevers estimated the capital outlay at £2500. The Committee could not see their way to this outlay, and placed the whole matter before the Caton Local

Authority. Mr. Gregson and his co-undertakers having intimated their willingness to carry out a water scheme on their own responsibility, the Local Authority decided to leave the matter to them. The work was put in hand, and up to the present time a sum of £5193 had been sunk in the undertaking.

Mr. *Thorp*, acountant, said Mr. Gregson kept the whole of the books up to the time of his death, and witness's firm had kept them since. The capital expended to December last was £5293; and the income varied from £302 upward and downward over a given period of years, and showed the true earning power of the works to average about £328 per annum. The interest which the promoters had received on their outlay commenced at about 2 per cent. in 1886, and went up gradually to 5 and 6 per cent in the succeeding years. There were small sums placed to reserve, which now amounted to about £400.

Mr. *Henry Heaton*, of the firm of Myres, Veevers, and Myres, the Engineers for the reservoir works, described the construction of the reservoir. Its total capacity was 1,100,449 gallons; and the top-water level was 330 feet above Ordnance datum. The reservoir was fed from three intakes on the watershed; and previous to entering the reservoir, the water was filtered. The watershed was uncultivated land; the area contributing to the three intakes being 561 acres. The following pipes were laid above the reservoir: 483 yards of 3-inch, 173 yards of 6-inch, and 129 yards of 9-inch. Below the reservoir there were 24 yards of 9-inch, 129 yards of 6-inch, 3401 yards of 4-inch, and 1181 yards of 1½-inch pipes.

Cross-examined by Mr. MELLOR, witness said that the water was very soft. The 1½-inch pipes were rather small; but he thought the pipes in question were sufficient for the purpose. He had made a valuation of the works, and put the figure at £10,728. He arrived at this by taking the revenue of the year at £328 13s.

Mr. *W. Foxcroft*, collector, said there had always been a good supply of water. In one year the reservoir was reduced to a level of 6 feet, through a pipe being left running. The water in the reservoir stood at 17 ft. 6 in. on June 18, 1901, and the lowest was 12 ft. 5 in. on July 22.

In cross-examination, Mr. MELLOR put before witness figures to show that in 1891 the total number of people in the district was 1248, while in 1901 it was 1181. Witness agreed that this was a substantial decrease. The higher number in 1891, was owing to the presence of men who were engaged on the Thirlmere Water-Works. In 1881, however, the number of inhabitants was 1085.

Mr. *Heaton*, recalled and questioned by Mr. MELLOR, said that the valuation he made was £10,728. That was 33½ years' purchase. He had in his mind, in making the calculation, a sufficient sum of money as the prospective value of the works.

Mr. MELLOR: What did you put down as prospective value?

Witness: I made it more out of curiosity, and I put it down at £1048.

What process did your curiosity go through?—I considered the capability of the works, which is not yet reached. They are capable of bringing in a greater revenue than they do at the present time; and I fixed in my mind a certain sum which would represent an annual increase in revenue. I took it upon the 3½ per cent. table. I think the revenue will increase for seven years at the rate of £6 per annum; and the surplus capacity of the reservoir works may be reached possibly in seven years.

Monday, June 16.

Mr. *E. K. Burstal* said he believed the present works were sufficient at any rate for the next few years. He believed the purchase clause was in the usual Board of Trade terms. Everything was by agreement; there was no necessity to emphasize compulsion. The works had been constructed, and there was nothing to prevent anyone else coming in. He considered they had power to take the water.

Mr. *G. R. Strachan* considered 33½ years' purchase was the proper valuation. His valuation was £10,728. He took it upon the 3½ per cent. table. He had no doubt the income would increase. The additional houses would improve the business, for the rating per house was better than the rating per head. The point was that there had been a gradual increase by the better housing.

By Mr. MELLOR: He did not think there was any need for a sinking fund; the works were too small, and were simplicity itself. He could not fix in his mind any total sum for renewal; but he did not think it would exceed £8 or £9.

This concluded the case for the Company; and evidence for the Council was then given.

Mr. *John Marshall*, District Surveyor, said there was no great rush of building in Caton. The gentlemen who constructed the water-works owned between them nearly all the area supplied. The average rental of the houses was from £8 to £10 per annum.

Mr. *Thomas Fenwick* said the net income for 1901 was £320. The supply of water was ample for the district; but he considered something ought to be put by for renewals, as the works could not last for ever. Allowing the reservoir a life of fifty years, there should be an equivalent of £9 3s. per annum, and for the pipes and mains, £6 8s. There should be a renewal or sinking fund of £35 11s. He considered the six months' notice took away prospective value.

Cross-examined: He could not explain how it was that he reported in 1895 that there was ample supply of water at Caton for both Halton and Caton; and yet in 1900 he reported that there was not sufficient supply in the reservoir in case of drought for Caton. He was, however, firmly of opinion that before long the reservoir would have to be increased. He had not allowed anything for prospective value.

Mr. SANDERSON: Supposing, for the sake of argument, that these works are to be sold in the market, and putting aside the matter about the six months' notice, if the undertakers go into the market and try and find a purchaser, would not the seller and purchaser have some regard as to the increase and diminution?

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 86.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb.	100—102*	+2½	4 18 0
200,000	5	May 14	6½	Bombay, Ltd.	6—6⅛	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅝	..	5 9 5
380,000	Stk.	Feb. 13	12	Brentford Consolidated	245—260	..	4 12 4
270,000	,,	,,	9	Do. New	189—194	+1	4 12 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—133	..	3 15 2
206,250	,,	June 12	4	Do. 4 p.c. Deb.	111—114	..	3 10 2
220,000	Stk.	Mar. 13	10	Brighton & Hove Orig.	205—210	..	4 15 3
246,320	,,	,,	7	Do. A. Ord. Stk.	148—153	..	4 11 6
420,000	20	Apl. 11	10	British	39—41	..	4 17 7
50,000	10	Feb. 13	12	Bromley, Ord. 10 p.c.	23—25	..	4 16 0
82,850	10	,,	9	Do. 7 p.c.	18—20	..	4 10 0
500,000	10	May 14	6	Buenos Ayres (New) Ltd.	9½—10⅜	..	5 14 3
220,000	Stk.	June 21	4	Do. 4 p.c. Deb.	94—96*	..	4 3 4
150,000	20	Mar. 13	8½	Cagliari, Ltd.	21—23	..	7 3 6
100,000	10	June 12	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2
550,000	Stk.	Apl. 11	12	Commercial Old Stock	265—270	..	4 8 11
236,425	,,	,,	9	Do. New do.	205—210	..	4 5 9
238,237	,,	June 12	4½	Do. 4½ p.c. Deb.	130—134	..	3 7 2
800,000	Stk.	May 28	8	Continental Union, Ltd.	138—143	..	5 11 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	147—152	..	4 12 1
575,000	Stk.	Feb. 27	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—127	..	3 18 9
9 140	,,	—	5	Do 5 p.c. Deb. Stk.	140—143	..	3 9 11
486,090	10	Jan. 30	10½	European, Ltd.	19—20	+½	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	+½	5 5 0
1,213,200	Stk.	Feb. 13	4⅛	Gas- 4 p.c. Ord.	94—96	..	4 11 8
2,600,000	,,	,,	3½	light 3½ p.c. max.	90—92	..	3 16 1
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	111—113	..	3 10 10
4,193,975	,,	June 12	3	Coke 3 p.c. Con. Deb.	92—94	+1	3 3 10
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	May 14	10	Imperial Continental	203—206	+1	4 17 1
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 27	10	Liverpool United A	220—222	..	4 10 1
718,100	,,	,,	7	Do. do. B	166—168	..	4 3 4
306,083	,,	June 24	4	Do. do. Deb. Stk.	116—118*	..	3 7 10
75,000	5	June 12	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	108—110	..	4 10 11
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	June 12	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,595,892	Stk.	Feb. 21	4½	Newc'tle & G'tesh'd Con.	105—106	−½	4 2 7
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.	98—100*	..	3 10 0
150,000	5	May 28	8	Oriental, Ltd.	7—7½	..	5 6 8
135,000	4½	,,	8	Do.	6—6⅝	..	5 10 9
15,000	1	,,	8	Do.	1⅝—1⅞	..	4 11 5

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Mar 13	7	Ottoman, Ltd.	⅝—¾	..	5 3 8
851,070	10	Apl 25	7	River Plate Ord.	10—10⅜	..	6 13 4
250,000	Stk.	June 21	4	Do. 4 p.c. Deb.	93—96*	..	4 3 4
250,000	10	Mar. 26	8	San Paulo, Ltd.	12—13	..	6 3 1
135,000	Stk.	Mar. 13	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	238—240	..	4 3 4
523,498	,,	,,	10	Do. C	257—259	..	4 3 8
5,850,000	Stk.	Feb. 13	5	South Met., 4 p.c. Ord.	121—124	..	4 0 8
1,627,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	93—95	..	3 3 2
380,940	Stk.	May 14	5	Southampton Ord.	102—106	..	4 14 4
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 27	5½	Tottenham and Edmonton A. 5 p.c.	120—125	..	4 8 0
260,520	,,	,,	4	Tottenham and Edmonton B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	7—8	..	6 5 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—95*	..	5 2 0
230,000	5	Mar. 13	9	West Ham, 10 p.c.	10—11	..	4 1 10
172,000	10	,,	6	Do. 7 p.c.	13—14	..	4 5 8
				WATER COMPANIES.			
730,599	Stk.	June 24	11½	Chelsea, Ord.	300—310*	..	3 14 2
150,000	,,	,,	5	Do. 5 p.c. Pref.	152—157*	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—143*	..	3 2 11
175,785	,,	Mar. 26	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Mar. 26	8	East London, Ord.	215—220	+2	3 12 9
654,740	,,	June 12	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,018,046	,,	,,	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
700,000	50		8	Grand Junction 10 p.c. max.	112—117	..	3 8 5
310,000	Stk.	Mar. 26	4	Grand Junction 4 p.c. Deb.	127—130	..	3 1 7
708,000	Stk.	Feb. 13	16	Kent	290—300	..	5 6 8
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	June 24	11	Lambeth, 10 p.c. max.	290—300*	..	3 13 4
406,200	100	,,	8½	Do. 7½ p.c. max.	210—220*	..	3 17 3
350,000	Stk.	Mar. 26	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Feb. 13	12⅝	New River, New Shares	400—410	..	3 2 5
1,000,000	Stk.	Jan. 30	4	Do. 4 p.c. Deb.	127—132	..	3 0 7
902,300	Stk.	June 12	7	South-wark and Vauxhall Ord.	190—195	+2	3 11 10
126,500	100	,,	7	South-wark and Vauxhall 7½ p.c. max.	180—185	..	3 15 8
489,200	Stk.	,,	5	South-wark and Vauxhall 5 p.c. Pref.	152—157	..	3 3 8
1,019,585	,,	Apl. 11	4	South-wark and Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 12	10	West Middlesex	275—285	..	3 10 2
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	139—144	..	3 2 6
200,000	,,	Mar. 13	3	Do. 3 p.c. Deb.	95—97	..	3 1 10

* Ex div.

Witness: Yes; they would not give 30 years' purchase if they did not think the income would increase.

Why not more than 30 years' purchase?—It would not produce an income to pay them.

Put aside the question of six months' notice, and treat it as if it was a question of sale by them in the open market, and tell me why it should not be a 33½ years' purchase?—It is not a first-class security. There is an old-fashioned reservoir.

It is an undertaking that could be worked with little plant and expense. It is entirely worked by gravity; and the pipes are in good order?—It is a very fair works.

Mr. *G. H. Hill* expressed the opinion that the six months' notice would influence any purchaser—in fact, he did not think anyone would buy a concern when he might within six months be offered his money back and lose the undertaking. Witness, in his valuation, worked on a 27 years' basis; but had it not been for the limitations, he should have taken 30 years. He had contemplated the future for 20 years, for which period he considered there was sufficient water. His total valuation was £8092.

Mr. MELLOR said there was nothing which gave the undertakers a right to take water from the stream. They owned the whole of the land, and were able to take the surface water; but they were only entitled to take the water from the stream for specific purposes, and had no right of themselves to construct water-works. But a time came when it became a necessity for the health of the district that there should be a supply of good water for the health of the people; and the result was that these gentlemen constructed the works and benefited themselves, and sold the water without authority. If their title was now not a strong one, it certainly depreciated the value of the undertaking. He contended that the Arbitrator could take no notice of prospective increase, and that the six months' notice of purchase ended the whole matter.

Mr. SANDERSON having replied, the Arbitrator reserved his decision.

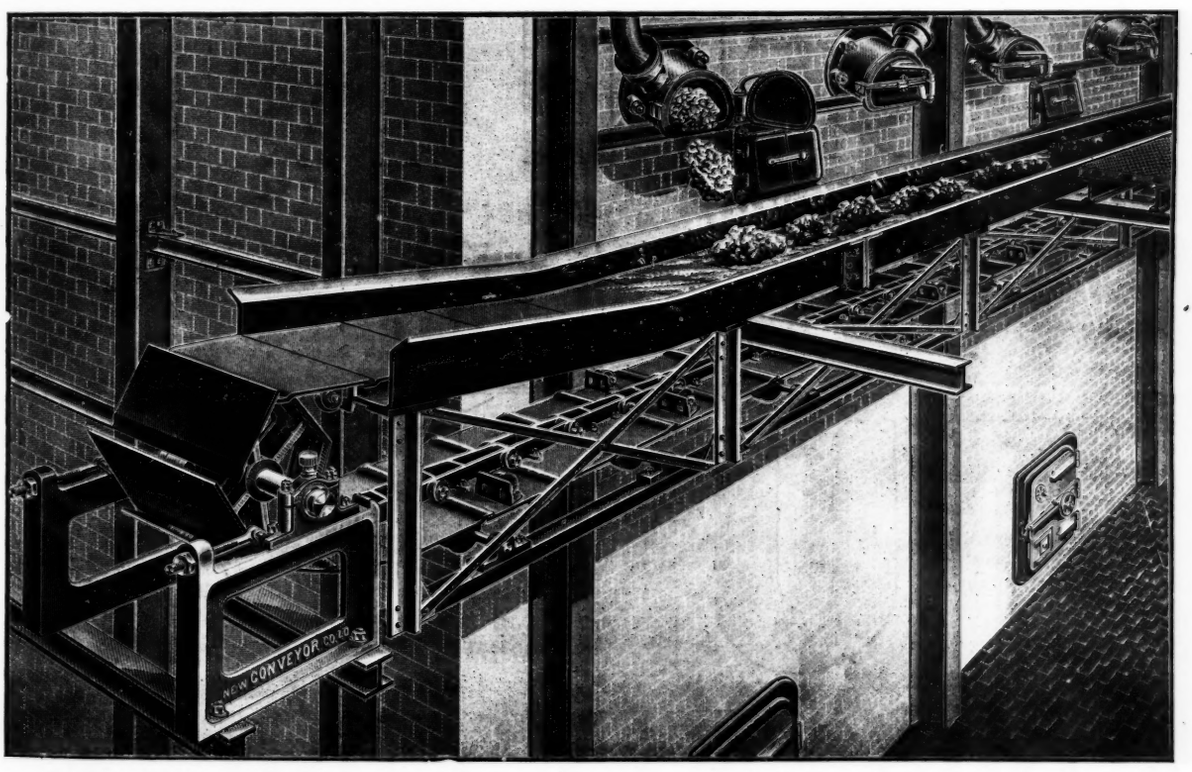
SERIOUS EXPLOSION AT READING.

Slovenly Gas-Fitting.

A terrific explosion occurred at Reading last Friday evening, in a large semi-detached house in one of the residential suburbs of the town. Its force was so great that the shock was felt over a radius of more than 500 yards of the scene; and the entire house and its contents were completely wrecked. The local Fire Brigade were soon on the spot, but fortunately their services were not required. The house, which had recently been done up, after having been empty some little time, had just been taken by a Mr. Smith, a local tradesman, who commenced moving into it on Wednesday last, on which day the Gas Company fixed a meter for him, and, as is their usual custom, left the outlet, &c., to be attended to by the tenant's fitter. On the day of the explosion, the ingoing tenant employed a local man to make the connection, and fix various gas-fittings, &c., which work was completed (apparently satisfactorily) at 4.30 p.m, at which time the gas was turned on. The house was then shut up until between 8 and 9 p.m., when Mr. Smith returned with his wife and son. Finding nothing amiss, they lighted burners in several parts of the house, including one in the drawing-room. Shortly afterwards, Mr. Smith was outside, near the cellar where the meter was fixed, and thought he could smell an escape of gas, but could not detect anything there. He accordingly proceeded into the house, and he states that on arriving near the drawing room door the explosion occurred, and he seemed to be met with a sheet of flame. The most miraculous thing is that no one was injured. The lad who was in the drawing-room was thrown to the floor, while Mr. Smith was struck on the leg by a portion of the door; but no further injury was sustained.

The nature of the explosion may be judged by the extent of the damage, which is roughly estimated at from £400 to £500. The front wall of the house is ripped open from top to bottom, and the kitchen at the back has the roof partly lifted off, and one side wall blown out; the end wall also being torn asunder. The drawing room door was broken into about 40 pieces, and the remains hurled across the front hall. The only door in the building which is left standing is the front one, out of which the stained glass and lead settings have been blown and smashed. The entire ceiling in the front drawing room came down, breaking everything portable. In the front bedroom above, the floor was partly lifted, and the skirtings torn from the walls, while the marble tops of two washstands were destroyed. All the windows (which were of plate glass) were scattered over the neighbourhood—the scene presented being almost indescribable; and several residents in the vicinity complain of having articles damaged by the force of the shock.

The Outdoor Superintendent to the Gas Company (Mr. Charles H. Eves) made a careful survey of the premises the morning after the explosion, and he has reported on the cause as follows: "When the house was altered and remodelled, it was carcassed throughout with iron tubing; provision having been made for a gas-fire in the front bedroom over the drawing-room, for which purpose a ½ inch T was put in, under the floor, near the fireplace. Whoever did this work should have screwed a plug into it; instead of which a rough piece of wood was cut and thrust in. Mr. Smith's fitter knew nothing of this T, and (after fixing his fittings) left, apparently satisfied that all was right. When the gas was turned on, the amount escaping from this point was between 80 and 100 cubic feet per hour, and the fact of the floor being entirely covered with floor cloth made the space between the floor and the ceiling below an admirable chamber for the accumulation and admixture of gas with existing air, which, when it reached the explosive point, must have been fired by direct contact from the one light burning on the chandelier in the drawing room beneath, with the before-mentioned results."



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SOLE MAKERS—

NEW CONVEYOR COY., LD., SMETHWICK.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I dare say the officials of the Edinburgh and Leith Gas Commission would look forward with anxiety to the close of their financial year on 15th of May. For them it was the most critical year of their existence. They had not only to bear the heavy capital charges upon the undertaking already existing, but they had also to bear the burden of unproductive capital, now amounting to £498,000, expended upon the new gas-works at Granton. Before another balance is struck, these works will be yielding a return. The ridge will have been crossed, and though the way may not be much easier for some distance, its uphill nature will have disappeared, and every step may be expected to make the going smoother. With this as the standpoint from which to look at the accounts for the year, which have been issued by Mr. John S. Gibb, the Treasurer, there can only be one feeling at the result—gratification. The prospect is opened up of the Commissioners being able to accomplish the readjustment of the capital fund without having recourse to the raising of the price of gas. This was the original aim. That it was not quite realized was due to the increase in the price of coal, and not to anything which the Commissioners could have avoided. This is a side of the subject which deserves to be kept in mind when the time arrives for giving honour to whom honour is due. It must be kept in mind that the capital account of the Commission has risen from £450,000 in 1888 to £1,206,670, and that, notwithstanding that the capital to be handled is well-nigh three times as much as it was then, the price of gas is actually less at the present time. So much for the triumph of the economist in gas production. The total revenue in the past year was £327,556, which is £4156 higher than a year ago, and is the highest the Commission have ever had. The price of gas was for the whole year 3s. 4d. per 1000 cubic feet; whereas in the year preceding it was only at that figure from October, having been 3s. before that. The effect of this is that last year's revenue from gas was £291,164, or £10,321 more than in the preceding year. Coke realized £11,714, or 9768 less; tar and ammoniacal liquor, £12,927, or £7342 less. But there is this year a new item of revenue in sulphate of ammonia, from which there was a clear revenue of £11,061; and this makes the tar and liquor account show an increase of £3719. The total yield from gas and residuals is thus £327,866, or £5722 more than in the preceding year. On the expenditure side, 275 tons less coal was used, and the price paid was £117,783, or £23,260 less. Of oil for carburetting, 756 tons more were used. The price was £15,161, or £293 more. There was thus a saving upon carbonizing materials of £22,967. The total cost of the manufacture of gas was £203,726, or £24,159 less than in the preceding year; distribution cost £27,194, or £3997 more; management cost £10,000, or £276 more; feu duties and rates and taxes cost £7641, or £4854 more, of which £4744 was due to rates and taxes; allowances to old employees cost £36 more, and to the families of reservists £113 less; law and parliamentary expenses cost £573 (due in great part to litigation), or £419 more; accidental damages cost only £7 3s., or £26 less than last year, which is a powerful tribute to the care with which the works are managed; discounts, abatements, and bad debts amounted to £6726, or £154 more than in the previous year. The accounts will come before the Commissioners on Monday. They are altogether the financial record of a splendid year's work.

The Gas Committee of the Dundee Town Council are at present receiving applications for the post of Engineer and Manager. A meeting of the Committee delegated with the duty of purchasing coal for the gas-works has been held. It is stated that it was resolved, in view of the provision of coal that had been secured, not to make any further purchases in the meantime; that the Committee, in reviewing their work, found that their policy of buying as occasion offered had been attended with most successful results; and that a saving of about £3000 had been effected by holding off at a time when tenders for extensive contracts had been made by coalmasters.

At the annual meeting of the Castle Douglas Gaslight Company on Thursday, it was reported that there had been a considerable increase in the consumption of gas over the preceding year. A dividend at the rate of 7 per cent.—the same as last year—was declared. The seventeenth annual general meeting of the Lochgelly Gas Company was held yesterday. The report of the Directors showed that 4,673,050 cubic feet of gas had been manufactured during the year, and that the sum at credit of the profit and loss account was £561. A dividend at the rate of 7½ per cent., with a bonus of 2½ per cent., was declared, and the price of gas was reduced from 4s. 6d. to 4s. 2d. per 1000 cubic feet. The Auchterarder Gas Company have paid a dividend at the rate of 5 per cent. The Vale of Leven Gaslight Company have paid a dividend at the rate of 8 per cent., and have reduced the price of gas by 3d. per 1000 cubic feet. The Strathmiglo Gas Company have paid a dividend at the rate of 2½ per cent. The Markinch Gaslight Company have paid a dividend at the rate of 5 per cent., and have reduced the price of gas from 5s. 5d. to 5s. per 1000 cubic feet.

The annual meeting of the Galashiels Gaslight Company was held on Tuesday last. The report of the Directors showed that the quantity of gas manufactured during the year was 56,177,500 cubic feet, and of that amount 53,065,474 cubic feet passed through consumers' meters—an increase of 1,878,705 cubic feet over the consumption in the previous year. The profit for the year amounted to £2111. A dividend at the rate of 10 per cent. was paid, and the price of gas was reduced from 3s. 9d. to 3s. 6½d. per 1000 cubic feet.

Good fortune continues to attend the Hawick Gaslight Company, whose annual meeting was held yesterday. The Chairman—Mr. T. Laidlaw—said that last year, in moving the adoption of the report of the Directors, he said it was one of the most satisfactory he had ever placed before them; but he was pleased to say that this one far and away beat it in every respect. The increase in the make of gas was more than 6 million cubic feet, and the profits were over £2400—the largest

JOSEPH AIRD
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STAFFORDSHIRE.
TUBES
AND FITTINGS.
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they had ever made during the whole of their history. The exceptionally good report reflected great credit, not only on the wise and judicious guidance of the Directors, but on the Managers, Messrs. J. & W. A. Smith, who had jointly been indefatigable in their efforts to do their utmost to give a good and cheap light, which he had always advocated. Much of this year's success was attributable to a new process which had been tried and found eminently satisfactory, enabling them to reduce the price of gas 5d. per 1000 cubic feet. Penny-in-the-slot meters were introduced in 1898. They had then 108 of them; now they had over 600 in use, and they still continued to be well taken advantage of. The Directors held their last meeting at the works, and found them tidy and clean, and in good working order. The preparations for the coming season are well forward—the retort-bench had been renewed, and two of the gasholders are being repaired at a cost of about £1200.

This is satisfactory to all; but opinions will differ as to the wisdom of the decision of the Town Council of Hawick on Wednesday, in the matter of the public lighting of the town. The Gas Company offered to provide ten Welsbach self-intensifying lamps and 436 ordinary lamps, and to supply the gas, clean, light, extinguish, and repair the lamps, for £844 a year. The Urban Electric Supply Company offered to provide ten 10-ampere arc lamps and 400 incandescent lamps, and to supply the current, clean, light, extinguish, and repair the lamps, for £1070 a year. The contract is to be for five years. There was a difference of £226 between the two offers—that of the Electric Light Company being nearly one-fourth more than that of the Gas Company. Yet the higher one was accepted. There must be municipal freaks in Hawick as well as in Aberdeen.

I wonder if, when the disaffected ones in the Perth Town Council succeeded in getting Mr. Thomas Newbigging appointed to make inquiry into the alleged increase in the gas bills, they expected he would do the work for nothing. I suppose not; but I had a suspicion that their expectation was that the cost of the inquiry would amount to but a mere trifle. It is announced, in language which displays the same tone as existed in the course of the agitation, that the ratepayers of Perth will learn with some surprise that Mr. Newbigging's bill amounts to a trifle over £150; and it is added that it is understood that no abatement is to be allowed by the Gas Commissioners to any of those who complained regarding their bills, and that it is just possible that a number of the irate consumers will take the case to a Civil Court and fight the Commissioners. It is suggested that someone should fight the Commissioners. Well, with Mr. Newbigging's report in their hands, the Commissioners need fear no foe; but this phase of the question which has developed shows how just was my remark that those who were responsible for the appointment of Mr. Newbigging should defray the cost of his inquiry. It is evident that if his report had been favourable to them, they would have founded upon it, which would have meant that the malcontents had contrived to make the Corporation provide evidence to undo themselves. They apparently wish to make use of it, even though it is unfavourable to them—which is surely infatuation run riot. I may recall that Mr. Newbigging spent a week in Perth in the prosecution of his inquiry. Judged, therefore, by professional standards, his fee is exceedingly moderate.

The annual tour of inspection of the Glasgow city water-works by the Corporation took place on Thursday and Friday of this week. The company numbered over fifty. They went to the Aberfoyle district first, and thence proceeded to Callander, where they spent the night. There, in accordance with custom, the councillors met in an informal manner for the purpose of nominating the candidate who will receive their support for the Provostship, which becomes vacant in November next. The choice of the members unanimously fell upon Councillor John Ure Primrose. On Friday, the party went through the Loch Katrine district.

The report of the Water Committee of the Glasgow Corporation for the year has been issued. It states that the ordinary revenue amounted to £220,918, from hydraulic works to £9767, and from river supply works to £3434—making a total of £234,121, or, including the balance of £7167 from last year, £241,288. The ordinary expenditure, including annuities and interest, amounted to £155,175, for hydraulic power works to £7463, for river supply works to £3706—in all, £166,345, leaving a balance of £74,943. Of this sum, £60,221 was carried to the sinking fund account, and £14,722 placed to the credit of the revenue account for next year. The revenue from the domestic water supply within the municipality, less abatements, was £43,114, an increase of £936; from the domestic water-rate outside the municipality, less abatement, £27,772, an increase of £1435; from trade charges within the municipality, £26,843, an increase of £517; without the municipality, £5856, an increase of £308; from meter supplies within the municipality, £68,949, an increase of £9174; and without the municipality, £23,539, an increase of £3082. The total revenue showed an increase on the previous year of £17,609; the total expenditure a decrease of £5028. The amount expended on works during the year was £40,482. The capital spent on the Craigmaddie reservoir, works, new aqueduct, and raising the level of Loch Katrine, amounted to £1,343,654; and the unexhausted borrowing powers were £50,288. The sinking fund set apart for, and being applied in, the redemption of annuities and in the repayment of borrowed moneys amounts to £1,135,849. The supply of water sent into the city and district during the year ending the 31st of May last averaged as follows: From the Loch Katrine works, 55,411,865 gallons per day; from the Gorbals works, 4,631,401 gallons—together, 60,043,266 gallons. Average for 1900-1, 56,344,681 gallons; increase, 3,698,585 gallons. The quantity of water supplied from the river works has averaged 2,934,312 gallons per day for 1901-2—an increase of 390,441 gallons.

The water supply in Dundee during the past year was at the rate of 9,996,946 gallons per day, as compared with 10,042,648 gallons in the preceding year. The supply per head of the population per day was at the rate of 49 gallons. In presenting the annual accounts to the Corporation, Treasurer Ritchie said they had closed the year with an actual deficiency of £517, in place of an estimated surplus of £73.

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The total estimated revenue was £49,455, the actual had been £49,976; so that, as regarded revenue, they were better than they expected to be by £519. The estimated expenditure, including the deficiency of £186 brought from the preceding year, was £49,381; whereas the actual had been £50,492, showing an excess over the estimate of £1110. The amount received from special rates last year had been the largest ever recorded; being no less than £29,996. On the other hand, the expenditure during that period had been absolutely the highest in their existence. The growth of the taxation they had to pay was phenomenal. In spite of the fact that their valuation for last year was £537 under that of the previous year, and that the Inland Revenue authorities had ceased to exact income-tax on profits, thereby relieving them of a burden of at least £200 per annum, parish, county, and burgh rates had exceeded their estimate by £250. For maintenance and management the estimate was £6450; while the actual had been £7477, showing an increase of £1027. Of this sum, the Works Department was responsible for about £800. The capital expenditure for the past year—£6226 10s. 8d.—had been the largest they had had since 1893-94. As regarded sinking fund, they had set aside this year £6739. At May 14 last year there was an unutilized balance of £3182; making together a sum of £9922 remaining in their hands for the purpose of paying off their debt. Up to May 14 last, they had paid off £9265; and he might state that the balance—£657—was utilized for a similar purpose on the following day. Up to May 14 they had cleared off debt to the extent of £96,446; and at that date the balance remaining unpaid, exclusive of the capitalized value of the annuities, was £510,177.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 5.

Sulphate of Ammonia.

The depression of the past few weeks has become further accentuated, and the closing quotations are £12 5s. per ton f.o.b. Hull, and £12 6s. 3d. to £12 7s. 6d. per ton f.o.b. Liverpool and Leith. Leith having been rather fully sold in advance, there has been little offering at that port. At other points, production has had to be disposed of, and, demand being slack, the decline has been inevitable—consumers everywhere being indifferent, and speculators who have "shorts" to cover preferring to take the chance of still lower prices later. Interest in the forward position has also been entirely absent, though very low speculative offers are being made abroad. Makers, however, have not so far shown much disposition to reduce their quotations.

Nitrate of Soda.

This remains quiet in all positions, and spot quotations are 8s. 6d. and 8s. 9d. per cwt. for ordinary and refined qualities respectively.

LONDON, *July* 5.

Tar Products.

The markets are quiet all round; and there is a decided absence of business. The demand for pitch in London is still very strong, while supplies are hardly equal to the consumption. There is nothing doing for shipment, as far as prompt delivery is concerned; but for electric and tramway purposes very high prices are still being paid. During the past week, a large business has been done for delivery in South Wales January-June next year, and at very good prices. As regards benzol, there is nothing doing; foreign consumers being quite indifferent as to the article. Crude carbolic is dull. Consumers will not now pay more than 1s. 9d. for 60's, July-September, while crystals are very dull. Business is reported in 39·40's at 5½d. per lb. prompt shipment. Creosote remains in the same position. Prices are fairly steady in London, but in the Provinces they are undoubtedly very quiet. Tuluol, solvent, and anthracene remain unchanged. There is no business to report in any of these articles, and prices are purely nominal.

The average values during the week were: Tar, 17s. to 22s. Pitch, London, 48s. 6d. to 52s. 6d.; east coast, 46s. to 47s. 6d.; west coast, 40s. to 41s. Benzol, 90 per cent., 8d.; 50-90 per cent., 7d. Toluol, 8½d. Crude naphtha, 2½d.; solvent naphtha, 9d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1¼d.; North, 1d. Heavy oils, 1½d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Naphthalene, 35s. to 50s. Salts, 21s. to 22s. 6d. Anthracene, "A," 1½d. to 1¾d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is quiet; and there is little demand for forward delivery. Business is again reported for July shipment at £12 5s., Beckton terms; but one London Gas Company are reported to have realized £12 10s. on their own special terms. Beckton would accept £12 2s. 6d. for September only. But for October-March, £11 15s. may be taken as their quotation, while for October-December £12 would probably be accepted. In Liverpool, the market is very flat, although there is a slightly improved demand for prompt shipment. Hull is very quiet. There are now sellers at £12 5s., July shipment, but buyers offer only £12 2s. 6d. As regards forward delivery, there are sellers at £11 15s. for September-April. In Leith, there does not appear to be much business doing; and it is difficult to obtain correct information as to actual transactions. There are certainly sellers at £12 10s. But buyers offer only £12 7s. 6d.; and there is really no business reported at this price. The market closes very quiet, and with an absence of demand for forward delivery.

The Gas Committee of the Leeds Corporation purpose supplying gas cooking-grids free to consumers having automatic meters, and at a rental of 6d. per annum to consumers having ordinary meters. Another change is a resolution that gas-fires can be had on hire by consumers at a low rental.

THE
MAXIM PATENT CARBURETTOR
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COAL TRADE REPORTS.

Lancashire Coal Trade.

The protracted stoppages of the pits in connection with the projected Coronation celebrations, have, of course, tended to steady the market for the time being; and the list basis rates remain without quotable change from last month. The position, generally, however, is tending towards some weakness. Already the output is overtaking requirements, and collieries are beginning to put down into stock; but as there are still very small accumulations either on the pit-banks or at the wharves and yards, it is scarcely likely that any surplus will be pushed for sale on the market for some time yet. The chief cause of weakness will probably be the sending of coal from outside quarters into this district, at low competing figures. In such cases, Lancashire collieries, though not altering basis rates, will no doubt, where required, make such concessions in price as are necessary to protect their regular trade. Fairly large contracts for gas coal have recently been concluded; but the settlement of these is not being pushed forward with any great eagerness by buyers, as there seems to be some uncertainty as to whether by waiting more favourable quotations may not be obtainable. So far, however, the Lancashire and most of the Yorkshire coalowners have held pretty firmly to the understanding not to reduce prices generally more than 1s., and at the outside 1s. 6d. per ton in special cases, on last year's contract rates. The average prices on business so far put through remain much as quoted recently. Housefire descriptions are now only meeting with a very small demand, with quoted rates unchanged. Common round coals for steam and forge purposes are more plentiful; and for these prices are showing some weakness, especially for prompt clearance sales, for anything like a quantity. On forward contracts, however, collieries are not disposed to give way to any very material extent on current rates. Ordinary steam and forge coals average, on inland sales, about 8s. 6d. to 9s. per ton at the pit; but for shipment, orders have been accepted, in some cases, as low as 9s. 6d. to 9s. 9d. per ton, with good qualities of steam coal quoted at 10s. to 10s. 3d. per ton, delivered at the Mersey ports. The better descriptions of slack are maintaining a firm tone at late rates; but there is scarcely that general improvement in this branch of trade which seemed probable a week or two back, the inferior sorts of slack continuing more or less a drug, and keeping down prices. At the pit, better qualities of slack average 6s. 6d. to 7s. per ton, and common sorts 4s. 9d. to 5s.; but slack in Derbyshire is obtainable at 2s. per ton under these figures.

Northern Coal Trade.

There is a better demand for coal, as the stocks had been reduced in the holidays; but there is now a normal output, and the supply seems to be adequate to the requirements. Best Northumbrian steam coals are 11s. 3d. to 11s. 6d. per ton f.o.b., second class steams are plentiful at from 9s. 6d. to 10s., and steam smalls are 5s. There is now a diminished demand for household coals; and prices are weaker. Coking coals are quiet, at unchanged values. In the gas coal trade, there is a slightly better demand; but it will be some weeks before it reaches the normal extent and gives full work to the collieries. Durham gas coals vary in price, not only according to the quality, but also with some influence of the condition of the pits in regard to the forward sales. From about 8s. 3d. to 9s. 3d. per ton f.o.b. is now the general range of prices. One or two additional contracts are in course of arrangement, but for moderate quantities only. Coke is steady—best Durham export qualities are from 17s. to 17s. 6d. per ton f.o.b., blast-furnace coke 15s. 6d., and gas coke firmer at from 10s. to 11s.

Scotch Coal Trade.

There is no change to record, as everything is waiting for the decision of the Arbiter—Sheriff Jameson, of Perthshire—next week, upon the question of the miners' wages. The prices quoted per ton f.o.b. Glasgow are: Main, 8s. 3d. to 8s. 6d.; ell, 9s. 3d. to 10s. 3d.; and splint, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 238,277 tons—an increase over the preceding week of 5496 tons, and of 21,647 tons over the corresponding week of last year. For the year to date, the total shipments have been 4,948,004 tons—an increase of 349,623 tons over the same period of last year.

The Interference with Gas-Mains at Ilford.—The award in the arbitration proceedings in this matter, noticed in the "JOURNAL" for the 24th ult., has been issued by Major-General Hutchinson, R.E. Under it the Ilford District Council are to relay the Gas Company's mains, for a distance of about 2½ miles, and bear the expenses of the arbitration. The parties are to pay their own costs as between solicitor and client.

Visit of the Oldham Gas Committee to the Chamber Colliery Company, Limited.—The Chairman and members of the Gas Committee of the Oldham Corporation, accompanied by the Mayor (Mr. J. Eckersley), Mr. A. Andrew (General Manager of the Gas and Water Departments), and Mr. T. Duxbury (Gas Manager), recently inspected the various collieries of the Chamber Colliery Company, Limited, of Oldham. The visit was made for the purpose of viewing the new and extensive plant erected at the various collieries for cleaning and dealing with the output of the different seams, principally gas coal, for which they are noted, more especially since the cleaning and picking arrangements have been completed. The party was conducted by Mr. F. Lees (Managing Director), Mr. Millington (Manager), Mr. Higson (Salesman), and Mr. P. Thompson (Engineer). The first place visited was the Woodpark Colliery, on the Ashton Road. Thence the party went to the Oak and Stockfield Collieries, and concluded their visit, which afforded them much interesting information, by an inspection of the workshops and general offices, at Hollinwood.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

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W. H. PEARSON, Junr., Deputy-Chairman.
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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.) 1,000,000 Cub. Ft
GRAVESEND, 300,000 C. Ft. BROCKVILLE (ONT.) 250,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft.

Huddersfield Gas Supply.—Mr. E. A. Harman, the Gas Engineer to the Huddersfield Corporation, points out that in the paragraph on this subject which appeared on p. 50 of the last number of the "JOURNAL" the quantity of coal used during the year 1901-2 should have been 60,598 (not 65,598) tons 8 cwt. 2 qrs. The concluding sentence, stating that 128 prepayment meters and 56 cooking and heating stoves were fixed, refers to the month of May only, and not to the whole year.

The Proposed New Gas-Works for Bingley.—Last Tuesday, a special meeting of the Bingley District Council was held to consider the proposal for the erection of gas-works at Dowley Gap. The estimated expenditure upon the new works, according to the scheme prepared by Mr. E. H. Swain, the Gas Engineer, is about £60,000; and the alternative is the extension and reconstruction of the greater part of the existing works, at a cost of from £30,000 to £40,000. In the end, two propositions were made—one being that tenders should be obtained for the new works, and then the Council to finally decide whether to proceed with the scheme; and the other, to adjourn the matter for further consideration. By a narrow majority, the proposal to obtain tenders was adopted.

Sales of Shares.—The Rugby Gas Company are raising new capital amounting to £5000, and last Friday offered for public competition 250 £10 shares, carrying a standard dividend of 7 per cent., subject to the sliding-scale, which allows of a present dividend of 10 per cent. The shares were put up in parcels of five, and realized from £22 15s. to £23 5s. per share. When 215 of the shares had been disposed of, it was found that the amount required had been reached, and the rest were withdrawn. At a recent sale by Messrs. Stafford and Rogers, Limited, £210 of stock of the Cambridge Gas Company was placed at the rate of £145 per £100 of stock. At Sheffield, on Tuesday last, £470 of "A" stock of the Sheffield United Gaslight Company was sold at the rate of £243 15s. per £100 of stock, and £161 10s. of "C" stock at £239.

Newcastle-under-Lyme Gas-Works.—All things considered, the Newcastle-under-Lyme gas undertaking has enjoyed a very satisfactory year's working. After the payment of interest, sinking fund, and all other charges, including the public lighting, and £250 handed over to the rates, there is a balance to carry forward of £200. The actual profit on the twelve months' working was £5400, or £400 less than the previous year. The price of coal was reduced to the extent of £180 only on the year; but residuals had realized nearly £2000 less. During the year, £2000 was added to the sinking fund, which now stands at £12,600. The debt is being paid off at a far greater rate in proportion than that of any other gas-works in the district; and it will be entirely cleared off in about 28 years. In 1882, the purchase price of the works was £74,000; and the make was 58 million cubic feet. The capital now stands at £80,000, with an annual make of 118 million cubic feet.

The Walker and Wallsend Gas Company and Electric Lighting.—In connection with the pending action between the Walker and Wallsend Union Gas Company and the Walker District Council, it was stated at the meeting of the Council last Thursday that certain letters had passed between the parties, and had resulted in a suggestion that a supplementary agreement should be entered into in which the Company should have the right to supply electricity to several local firms for a period of 42 years, in return for which they should waive their right to supply gas for public lighting in perpetuity, and also defray the costs of the pending action.

The Igneous Cements Company, Limited, have removed from Mansion House Chambers to No. 32, Old Jewry, London, E.C.

The Stettiner Chamotte-Fabrik Actien Gesellschaft (vormals Didier), of Stettin, state that, by inadvertence, they mentioned in the letter from which the paragraph in last week's "JOURNAL" was prepared that the retort-benches they are erecting at the Barmbeck (Hamburg) Gas-Works were for inclines. It should have been said that they were for horizontal retorts.

The Monte Video Gas Company, Limited, are inviting applications from existing share and debenture holders for £30,280 of 5 per cent. perpetual first mortgage debenture stock, part of an authorized amount of £80,000. There is to be no public issue.

Reference has already been made to the scheme which has been carried out for supplying Jerusalem with water, which, it may be remembered, is brought in iron pipes from a spring seven miles distant from the city. It appears from the report of Mr. Consul Dickson on the trade and commerce of Palestine last year that no notices were issued inviting tenders for the pipes; nevertheless a British firm were communicated with on the subject, and they offered to supply them at 4fr. 25c. per metre, c.i.f. Jaffa. The offer, however, arrived too late; a local German merchant having already obtained the order, and signed the contract with the municipal authorities for furnishing the requisite number of pipes from Antwerp at 4fr. 90c. The work was carried out with energy and expedition, although the pipes were hastily laid.

We have received a copy of the catalogue of Cresswell's Asbestos Company, Limited, of Bradford, containing prices and descriptions of their various designs of hollow asbestos fuel for use with gas-fires, and their non-conducting removable coverings for steam and hot and cold water-pipes. Besides these goods, in which our readers are more particularly interested, the catalogue furnishes particulars of many domestic uses to which asbestos has been put by the Company, foremost among which is their "Curfew" fire-proof blind, smoke preventer, artificial draught-raiser, and soot-screen for attaching to open fireplaces. So long as coal-fires remain in existence at all, any device which is calculated to lessen the troubles arising from them is to be welcomed; and there should be a good demand for an article possessing all the advantages claimed on behalf of the "Curfew."

C. & W. WALKER, LTD.,

Midland Iron-Works, Donnington, nr. Newport, Shropshire.

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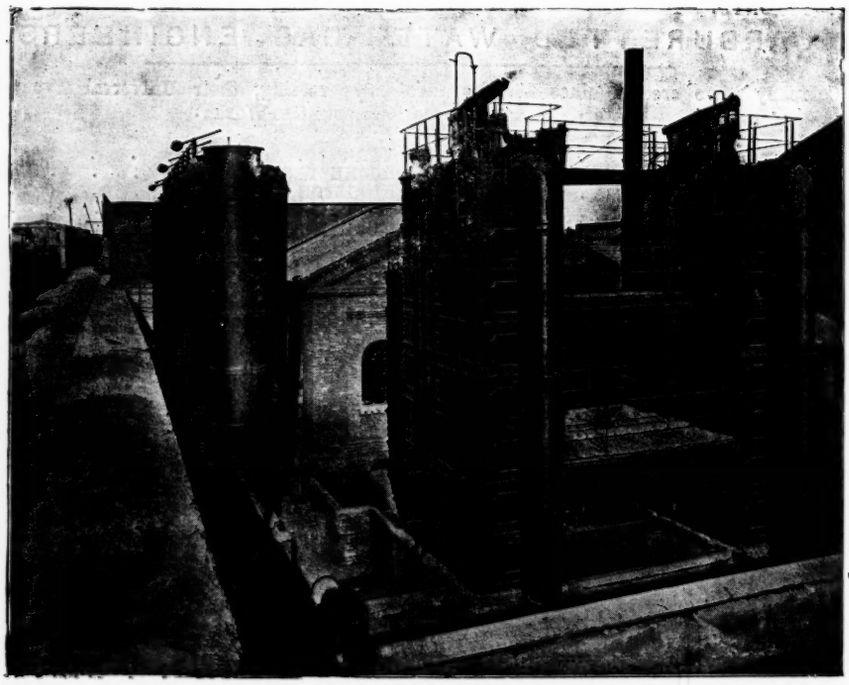
THE PURIFYING MACHINES REMOVE THE WHOLE OF THE AMMONIA AND TAR FROM THE CRUDE GAS TOGETHER WITH UPWARDS OF 50% OF THE CO_2 AND H_2S.



THE ANNULAR CONDENSER FITTED WITH WATER COOLING ARRANGEMENT COOLS DOWN THE GAS TO THE WATER TEMPERATURE IN THIS HOT CLIMATE.

WALKER'S PATENT CONDENSER AND PURIFYING-MACHINE AT SANTIAGO GAS-WORKS.

An exhibition of gas fires and cookers by Messrs. R. & A. Main was held in Hamilton last week, with Miss E. M. Dods, of Edinburgh, as lecturer. In opening the exhibition, Provost Keith stated that since 1894, when they had their first display of gas appliances, the number of gas-cookers in use had risen from 279 to 910; but if they took gas-rings into account, the number of gas-fires in use was about 1580.

We understand that Messrs. C. & W. Walker, Limited, of the Midland Iron-Works, Donnington, Shropshire, have received the order from the Glasgow Corporation for the whole of the scrubbing plant required for their new Provan Works, which will consist of four 3 million purifying machines. This is the seventh repeat order (making in all fourteen machines) which Messrs. Walker have received from the Glasgow Corporation, for machines for removing tar and ammonia from the whole of the gas supplied to Glasgow.

The Enniscorthy Gas Company have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for a new retort-house roof, new retort-stack, with Waddell's patent regenerators, stage-floor, &c. The work is to be carried out within the next three months under the supervision of Mr. J. J. Lyne, the Company's Manager.

Tenders for the erection of the engine-house and reservoir and the laying of the mains in connection with the new water-works for the Lydney Rural District Council, were recently received from eleven firms, and seven others tendered only for the supply of the mains. The plans and specifications were prepared by Mr. J. Fletcher Trew, of Gloucester, whose approximate estimate was as follows: Engine-house, £600; reservoir, £1750; mains, £5479—total, £7829. The tender accepted was that of Messrs. Scull, of Bristol; their figures being £600, £1678, and £5189 respectively—a total of £7467.

WANTED, FOR SALE, AND CONTRACT ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS WANTED.

DRAUGHTSMAN and CLERK OF WORKS. No. 3885.
DRIVER and FITTER at Water-Works. G. C.
METER INSPECTOR, &c. G. Snashall.
RETORT-HOUSE FITTER. Howland.

SITUATIONS VACANT.

ASSISTANT ENGINEER. Stockton-on-Tees (July 16).
ENGINEER and MANAGER. Dundee Gas Department (July 22).
GAS-STOVE REPRESENTATIVE. Willey and Co.
MANAGER. Cowes Gas-Works.
SECRETARY AND MANAGER. Denbigh Gas and Water Companies (July 18).
SULPHATE MAKER. Wigan Gas Department.
WATER-METER REPAIRER. Mid-Kent Water Company.
WORKING MANAGER. Mickleover and Etwall Gas Company.

PLANT (Second-Hand) FOR SALE.

CONDENSER (250,000 cubic feet). Redditch Gas-Works.
GASHOLDERS (various). Wright, J., London.
OIL-GAS APPARATUS. Pink, Merstham.
PURIFIERS. Mablethorpe Gas-works.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, &c. Firth Blakeley, Dewsbury.
STATION METER (20,000 cubic feet). Hereford Gas-Works.

SALES OF STOCKS AND SHARES.

BRISTOL WATER COMPANY. July 10.
RICHARDS, Mr. ALFRED—July 22: Hampton Court Gas Company, High Wycombe Gas Company, Pinner Gas Company, Southend Water Company, Walton-on-Thames and Weybridge Gas Company.
WHITBY GAS COMPANY. Tenders by July 18.

TENDERS FOR

BENZOL.
READ HOLLIDAY and SONS. 50,000 gallons. Tenders by July 12.

BOILER.
BODMIN. Wrought Iron, for Sulphate Purposes.

COAL.
CARNARVON. 3200 tons. Tenders by July 24.
CLONMEL. 2000 tons. Tenders by July 23.
HOLYHEAD. One Year's Supply. Tenders by July 17.
ILKESTON. 9000 tons. Tenders by July 14.
KENDAL. 5600 tons. Tenders by July 12.
KINETON. 350 tons. Tenders by July 15.
LITTLEBOROUGH. 5000 tons. Tenders by July 24.
NEWRY. 3000 to 3500 tons. Tenders by July 18.
SEDGLEY. 700 to 1000 tons. Tenders by July 23.
SHEFFIELD. One Year's Supply. Tenders by July 17.
WALLINGFORD. 1100 tons. Tenders by July 14.
WARRINGTON. 35,000 tons.

GASHOLDER.
BODMIN. Re-Sheeting Crown with Iron or Steel.

GAS SUPPLY.
SCHAERBEEK (BELGIUM). Tenders by July 30.

SULPHURIC ACID.
HEYWOOD. Tenders by July 15.

TAR.
CARNARVON. One Year's Surplus. Tenders by July 24.

TUBES AND FITTINGS.
HEYWOOD. Tenders by July 15.

WHY

is the

"EUREKA"

the most popular Cooker

on the

Market?

BECAUSE

it has a reputation

of nearly half a Century,

and has always given

unbounded satisfaction

wherever adopted.

An interim dividend at the rate of 10 per cent. per annum to June 30 has been declared on the ordinary shares of the Richmond Gas Stove and Meter Company, Limited.

The Cannon Iron Foundries, Limited, of Deepfields, Bilston, have issued a pamphlet dealing with their well-known "Porceliron" process for enamelling gas-cookers. They remark that the maintenance of these stoves has been a subject of great thought and anxiety among gas engineers and managers, owing to the trouble and expense this involves to undertakings adopting the hiring-out system. The difficulty is claimed to disappear with the use of "Porceliron," by means of which it is possible to properly enamel cast-iron interiors of gas-stoves. At the recent Crystal Palace International Gas Exhibition, the firm exhibited a stove fitted in this way, which had been in constant use for a number of years; and it was shown that the "Porceliron" had not been affected by the heat. An interesting feature of the pamphlet is a photograph of this stove—a "Hercules" cooker. Among the other advantages put forward by the Cannon Iron Foundries on behalf of their improved patented construction, is the great facility with which the stoves can be taken to pieces for cleaning purposes. The title of the pamphlet before us is, "The Problem Solved: the Maintenance of Hired Gas Cookers."

The tender of Mr. George Winstanley for the construction of an installation of inclined retorts at the Barry Gas-Works has been accepted. The amount of the tender is £8500.

Messrs. Biggs, Wall, and Co. have received orders for a manual charging machine for the Brentwood Gas-Works, and for a combined manual and power machine for the River Plate Gas Company, Buenos Ayres.

The Pulsometer Engineering Company, Limited, of Queen Victoria Street, London, and Nine Elms Iron-Works, Reading, have issued a new edition of their catalogue, containing a large number of well-executed illustrations showing the pulsometer in actual operation. The special features of this appliance are now too well known to need detailed description; but one of the chief is its ready applicability. It will work just as well when suspended from a chain or a rope as when permanently fixed; and, where the conditions remain constant, it will run day and night without attendance. For the drawing of foundations and as a contractor's pump, it has been very extensively employed. By the "Grill" arrangement, which has been introduced, the supply of steam is automatically cut off at each stroke; thus securing considerable economy in working. The new catalogue should find a place in engineering offices.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571 Central.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line 6d.

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OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.
JOHN WM. O'NEILL, Managing Director,
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ANDREW STEPHENSON, AGENT. All communications RE OXIDE to the COMPANY as above.

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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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FOR GAS PURIFICATION.
THE DUNSTABLE LIME COMPANY,
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